STATE OF WEST VIRGINIA

1991-1993

305(b) Report

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TABLE OF CONTENTS

APPENDICES *

A. Ohio River (ORSANCO) Data

B. Wetlands Inventory

C. Mine Drainage Impacted Stream Inventory

D. Lakes Information

E. Groundwater Data

F. Benthic Surveys, Toxicity Tests, Fish Tissue Samples

* Note: Due to their voluminous nature, the appendices are not included in this document. They may be reviewed at any of the DEP District Offices or the Office of Water Resources' main office located at 1201 Greenbrier Street, Charleston, WV. Copies also may be obtained from the Office at a nominal cost. For more information, contact the Office of Water Resources. Phone (304) 558-2108.

LIST OF TABLES

LIST OF FIGURES

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 WV Division of Environmental Protection (DEP), WV Division of Natural Resources (DNR), WV Bureau of Public Health, Ohio River Valley Water Sanitation Commission, U.S. Geological Survey, U.S. Forest Service and U.S. Army Corps of Engineers. It provides a general assessment of the quality of the state's surface and groundwater 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 basin plans published by the Division of Environmental Protection.

Of the approximately 32,000 stream miles in the state, 6,370 miles (about 20 percent) were assessed for attainment of Clean Water Act goals. If intermittent streams are excluded from the totals, then the percentage of stream miles assessed exceeds 30 percent. The 6,370 stream miles assessed in this report exceeds the number assessed in the 1992 report by a little over 1,000 miles. The increase in assessed stream miles is primarily due to the discovery of additional sources of data for use in the 1994 report.

The majority of data used in the 1994 report is less than five years old, thus it provides a current and accurate account of the quality of the states assessed waters. One of the goals for future reporting is to increase the number of miles of assessed waters. This will be accomplished by increasing monitoring efforts in priority watersheds as well as searching for new sources of monitoring data both inside and outside the agency.

Of the stream miles assessed during this reporting period, 24 percent (1,528 miles) fully supported their designated uses, 7 percent (433 miles) were fully supporting but threatened, 60 percent (3,822 miles) were partially supporting, and 9 percent (588 miles) were not supporting. About 80 percent (25,908 miles) of the state's streams were not assessed. However, this number includes over 11,000 miles of intermittent streams. If intermittent streams are excluded from the totals, then about 70 percent of the state's streams (14,744 miles) were not assessed in 1994.

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 is generally not performed in random fashion, it is prudent not to make general inferences about the quality of West Virginia streams based solely upon the data used in this report.

State lakes and reservoirs also were evaluated in accordance with section 314 of the CWA. Of the 21,522 lake acres assessed, 11 percent (2,282 acres) fully supported designated uses, 21 percent (4,504 acres) were fully supporting but threatened, 60 percent (13,006 acres) were partially supporting, and 8 percent (1,730 acres) were non-supporting.

All 93 of the state's public lakes were evaluated during this reporting period.

The major causes of impairment to state streams were identified as siltation, metals, fecal coliform, and pH. The major sources of stream pollution were identified as coal mining, urban runoff, silviculture, and combined sewer overflows. A breakdown of the various causes and sources of pollution impacts to streams is contained in this report.

The major causes of impairment to lakes were identified as metals, organic enrichment, total toxics, and siltation. The major sources of pollution were identified as coal mining, silviculture, industrial point sources, and petroleum activities.

A variety of streams and lakes were monitored for toxics during this reporting period. By definition, toxics refers to any member of a class of compounds listed in the federal register, Section 40 cfr Part 122, Appendix D, Tables II and III. The list includes a variety of organic compounds, pesticides, PCB's, heavy metals, cyanide, and phenols.

The majority of ambient toxics monitoring currently conducted in West Virginia waters is for heavy metals. Other toxic chemicals are monitored less frequently and usually in response to specific concerns.

Of the 6,370 stream miles assessed during this reporting period, 1,169 (18 percent) were monitored for toxics. Of the 1,169 stream miles monitored for toxics, 491 (42 percent) were found to contain elevated levels (i.e., levels exceeding state water quality criteria). Although 42 percent of the state's stream miles monitored for toxics contained elevated levels, it is important to note that most of the streams chosen for toxics monitoring were not selected in random fashion, but instead were selected because they were suspected of being polluted.

Of the 21,522 lake acres assessed, 14,986 (70 percent) were monitored for toxics. Of the 14,986 acres monitored for toxics, 7,810 (52 percent) were found to contain elevated levels. The only lakes found to contain elevated levels of toxics were a few of the large U.S. Army Corps of Engineers reservoirs, which had elevated levels of heavy metals in the hypolimnion (i.e., bottom waters). No toxic metals were found to exceed criteria in the surface waters of any lakes monitored for toxics. It is important to note that accumulation of toxic metals in the bottom waters of large flood control reservoirs is a common phenomenon, since lakes typically act as sinks for watershed pollution. Various tables that relate toxic impacts to public health and aquatic life are contained in this report.

West Virginia's wetlands (102,000 acres) comprise less than 1 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. West Virginia has an active Section 401 certification program; however, permitting authority for activities impacting wetlands (Section 404) resides within the U.S. Army Corps of Engineers.

West Virginia's wetlands management and regulatory process are administered through DEP's Office of Water Resources and DNR's Wildlife Resources Section. In August 1992, DEP received a grant from U.S. EPA to initiate and aid in the development of wetland water quality standards. The new standards will be made a part of Title 46, Regulations Governing Water Quality Standards, by the end of FY-93.

Groundwater in West Virginia is, on the average, both abundant and of adequate quality. This is true largely due to the rural nature of the state. Groundwater quality in developed, industrialized, or mined areas of the State often reflects the strong influence man has on his environment. It is common in these areas to find elevated levels of organics, inorganics, or bacteria.

Major sources of ground water contamination in the state include surface impoundments, septic tanks, coal mining, oil and gas brine pits, and injection wells. The Groundwater Protection Act passed in June 1991 by the state legislature provides West Virginia with the necessary framework to effectively manage the State's groundwater resources. The legislation provides authority to collect fees for program operations and remediation efforts, grants authority to the Water Resources Board to set groundwater quality standards, and allows for the creation of groundwater protection practices.

Passage of the Groundwater Protection Act will have a significant positive impact on the way the resource will be managed in the future. A substantial amount of the groundwater information contained in this report will focus on the issues surrounding passage of the new law.

Water pollution control in the state is primarily achieved through the National Pollutant Discharge Elimination System (NPDES) permitting system. 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 source control program also are performed and are intended to reduce this source of pollution. The vast majority of these inspections have been directed toward silviculture and construction activities.

An important program aimed at controlling acid mine drainage (AMD) from abandoned sites was initiated in 1992. The governor's Stream Restoration Program targets funds for limestone treatment of AMD damaged streams. This effort, funded primarily by the state's Abandoned Mine Lands (AML) program, has already lead to significant improvements in water quality in streams such as the Middle Fork and Blackwater rivers.

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 and biological monitoring, citizens monitoring, special surveys and investigations, and the use of benthic and toxicity data to assess environmental perturbations.

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.

Specific State water quality concerns include:

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 - Some rural areas of the State, particularly those with extremely depressed economies, remain without sewage collection and treatment systems. The result is the improper disposal of domestic sewage into the surface and groundwater.

Lack of land use policies - Development in small watersheds must be carefully controlled to assure the receiving waters are capable of assimilating any wastewater resulting from such development.

Upper Ohio River hydropower licensing - Potential impacts to the water quality of the upper Ohio River are a result of licenses issued for 16 hydroelectric projects by the Federal Energy Regulatory Commission (FERC) on the upper Ohio basin. The potential consequences of the development and operation of the hydropower projects not only include a decline in water quality, but a reduction in the wasteload assimilative capabilities of the river.

Monitoring programs - Many of the state's water quality monitoring programs have been scaled back due to insufficient funds and/or shortages in manpower. This includes compliance inspection and enforcement activities. The state is currently only able to monitor a very small percentage of its total stream miles.

Agricultural development in karst regions - Agricultural development has historically been a threat to water quality in areas characterized by karst geology (e.g., Potomac and Greenbrier River valleys). The dramatic increase in poultry farming in the state's eastern panhandle over the past few years compounds the problem. Potential problems associated with agriculture include nutrient and bacterial contamination of both surface and groundwater.

Recommendations for the improvement of water resources management include:

Nonpoint sources - Nonpoint source pollution is a major problem currently affecting the state's waters. EPA, along with other federal, state and local agencies are encouraged to continue their efforts in addressing these pollution sources.

Boundary waters - EPA must take the lead in resolving interstate concerns on border waters in order to meet wasteload allocations for these waters and to ensure that states do not work independently on facility permit issuance.

Establishment of human health risk criteria - Establishment of such criteria cannot be achieved at the state level. EPA, FDA (Food and Drug Administration) and other federal agencies should not only take the responsibility of establishing such criteria, but also ensure their implementation.

Watersheds impacted by mining - Special concern and consideration must be given to those watersheds in the state that are characterized by coal seams associated with acid bearing geologic strata.

Water quality monitoring - Development of a statewide monitoring strategy should be a priority for the Office of Water Resources so that it can adequately assess the quality of the state's surface and groundwater resources.

Sludge management - Both EPA and the State should continue to promote land application as a disposal option for municipal sludge. This will reduce the need for costly landfilling while providing a low cost alternative to soil additives and fertilizers.

Lake management and protection - Lake management and protection efforts are important to the State's citizens and should receive continued state and federal support. Of particular benefit would be development of specific lake water quality criteria in addition to creation of an information and education program on lakes and watersheds.

Citizen monitoring - Volunteer water quality monitoring has become a very popular activity in the state and has been an important tool in increasing the public's environmental awareness. This activity needs to have the continued logistical and financial support from both EPA and DEP.

Permitting and Enforcement activities - More manpower is needed for adequate permitting and enforcement of state water quality regulations and criteria. This can only be accomplished with adequate federal and state funding.

Part II: BACKGROUND

The West Virginia Division of Environmental Protection (DEP), Office of Water Resources (OWR) has prepared this report in accordance with Section 305(b) of the Clean Water Act (PL 92-500, as amended). The report provides a general assessment of West Virginia's groundwater, lakes, and streams (excluding the mainstem Ohio River). The assessment of the Ohio River mainstem is provided in the Ohio River Valley Water Sanitation Commission's report (ORSANCO, 1994)(Appendix A).

This assessment of West Virginia's surface and groundwater quality is developed from information collected during the period July 1991 through June 1993. The assessment is based on current data obtained from monitoring stations maintained by the Office of Water Resources, Bureau of Public Health, ORSANCO, U.S. Geological Survey, U.S. Army Corps of Engineers, and specific surveys. Additional assessment information in this report is based upon data provided by the U.S. Forest Service, DEP's Office of Mining and Reclamation, DNR's Wildlife Resources Section, and the state sponsored Save Our Streams citizen monitoring program. A small amount of information contained in the previous 305(b) report also was carried over into this report. Information carried over includes assessment data on mine drainage impacted streams, as well as streams which have been monitored within the past five years.

This assessment does have limitations that must be taken into consideration when interpreting the sampling data used to derive water quality status for basins, sub-basins and streams. A brief description of the major limitations follows. 1) A majority of the water quality data used in this assessment are, at best, from monthly sampling stations. Comparison of these data with water quality standards conditioned upon monthly means (e.g., fecal coliform bacteria) requires a degree of judgement. 2) There are more than 9,000 streams, totaling more than 32,000 miles in West Virginia. The majority of these were not sampled during this reporting period. Therefore, this assessment is not comprehensive in its coverage. 3) Streams sampled as part of special studies are normally chosen because of known or suspected pollution problems. This deliberate, non-random selection of polluted streams for monitoring may actually skew the assessment data and lead to somewhat negative conclusions about the general status of water quality in the state. 4) In many instances when assessing a waterbody, professional judgement must be used in order to determine use support status. This is especially true in cases where the monitoring protocols (e.g., sampling frequencies) do not follow those recommended in the 305(b) guidance document.

The major river basins discussed in this report are the Ohio, Guyandotte, Big Sandy/Tug Fork, Kanawha, Elk, Little Kanawha, New, Greenbrier, Gauley, Monongahela and Potomac. Three river systems form borders with other states and, as such, present special water quality management problems. These border rivers are the Big Sandy and Tug Fork rivers with 128 border miles, the Ohio River with 277 border miles, and the North Branch of the Potomac and Potomac River with 214 border miles. The state river basins contain more than 9,200 streams, that collectively total about 32,278 miles.

The most recent inventory of West Virginia lakes (U.S. EPA, 1991) indicates that there are about 574 of these waterbodies totalling 15,753 acres. This information, which is taken from Digital Line Graph (DLG) data supplied by the U.S. Geological Survey, actually underestimates the total lake acreage for the state. By themselves, the 93 public impoundments in West Virginia total 21,522 acres. All information regarding lakes in this report is based on an assessment of publicly owned waterbodies and does not take into consideration privately owned lakes and ponds.

The most recent inventory of freshwater wetlands (WVDNR, 1987) indicates there are 102,000 acres of various types of wetlands in the state.

The state has a surface area of 24,282 square miles. The most recent figures available indicate that this surface area is allocated to the following general land uses: 79 percent forest; 12 percent agriculture; 6 percent developed (industrial, commercial, urban, roads, etc.); 2 percent mining; and 1 percent wetlands.

West Virginia's 1990 census population of 1,793,477 represents an 8 percent decrease from the 1980 census population. More than 50% of West Virginia's population is classed as rural. A large portion of this rural population resides in small communities in narrow valleys. The population decline, along with unfavorable economic conditions and a limited amount of land available for commercial and residential development, too often result in direct discharge of sewage and/or improperly installed and maintained on-lot sewage disposal systems.

Because of the state's mountainous topography and unfavorable soils, mining, oil and gas exploration, and timbering operations also are of major concern, due to nonpoint pollutant contributions to many streams. Nonpoint pollution problems are particularly acute in the Big Sandy/Tug Fork, Guyandotte, Coal, Kanawha, Elk, Monongahela, and Little Kanawha River watersheds.

Agricultural waste handling and runoff are a concern mainly in the Potomac watershed, due to the number of agricultural operations and the area's limestone geology. Agricultural activities also are concentrated in portions of the Greenbrier River Basin and along portions of the mainstem Ohio and lower Kanawha rivers.

Concern over industrial (non-coal related) discharges is confined, for the most part, to parts of the Ohio, Kanawha, and Monongahela river watersheds.

Because of the monitoring network design, West Virginia's larger streams account for the greatest percentage of monitoring effort expenditures. Small streams are usually not monitored as intensively or frequently. Many small streams receive treated and/or abandoned mine waste and treated or untreated sewage. In addition, some are impacted by logging operations, oil and gas production and exploration, or farming and are generally more vulnerable to environmental perturbations than the larger streams.

Oftentimes, small polluted streams do not impair the uses of the larger streams they flow into. So while the ambient monitoring network may indicate that most of the state's larger streams are meeting their designated uses, many smaller streams remain severely degraded because of their size and the proportion of their flow to that of the incoming wasteload. In summary, while the ambient monitoring network generally indicates that the state's waterbodies support or partially support their designated uses, a number of small streams and segments of small streams are degraded and do not support their uses. A more comprehensive determination of the status of these small streams can be found in documents such as the 303(e) basin plans for the Monongahela, Little Kanawha, New, Greenbrier, Elk, Gauley, Big Sandy/Tug Fork, Guyandotte, Ohio, and Potomac basins; the acid mine drainage reports for the Cheat, Tygart, Monongahela, West Fork, portions of the Ohio basins; and the mini-ambient network reports. The state's Nonpoint Source Assessment (August, 1989) also may be referenced for such information.

The state's geology and topography limit the number and extent of wetlands, which cover only 159 square miles (0.65 percent) of the state's total surface area. Thus, West

Virginia is very concerned about the preservation of its limited wetland resources.

The Wildlife Resources Section of the Division of Natural Resources updated its wetlands inventory in 1987 (Appendix B). Some of these areas are mapped in "West Virginia Wetlands Inventory" (Bulletin No. 10, 1982), which is available from the Division of Natural Resources.

A brief inventory of West Virginia's water resources is provided in Table II-1.

Summary of Classified Uses

As outlined in the State Water Resources Board's Requirements Governing Water Quality Standards (46 CFR 1, Title 46, Legislative Rule, Series 1), "Unless otherwise designated by these rules, at a minimum all waters of the State are designated for the Propagation and Maintenance of Fish and Other Aquatic Life (Category B) and for Water Contact Recreation (Category C) consistent with Clean Water Act goals. When a discharge permit is to be issued all uses shall be assumed present unless the applicant demonstrates that the designated uses do not apply to the stream segment in question."

The following use categories have been designated for West Virginia's streams (note: these uses are also applicable to lakes.):

Category A - Water Supply, Public - This category is used to describe waters which, after conventional treatment, are used for human consumption. This category includes:

All community domestic water supply systems;

All non-community domestic water supply systems (i.e., hospitals, schools, etc.);

All private domestic water systems; and

All other surface water intakes where the water is used for human consumption.

Table II-1

Water Resources Atlas

State population (1990)	1,793,477
State surface area (square miles)	24,282
Number of water basins (according to state subdivisions)	11
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)	93
Acres of lakes/reservoirs/ponds (publicly-owned)	21,522
Square miles of estuaries/harbors/bays	0
Number of ocean coastal miles	0
Number of Great Lakes shore miles	0
Acres of freshwater wetlands	102,000
Acres of tidal wetlands	0

Category B - Propagation and Maintenance of Fish and Other Aquatic Life. This category includes:

Category B1 - Warm Water Fishery Streams. Streams or stream segments which contain a fish population composed overwhelmingly of warm water species. (These are primarily sport fisheries and may be stocked with trout seasonally.)

Category B2 - Trout Waters. As defined in Section 2.14

Category B3 - Small Non-Fishable Streams. Streams or stream segments which, because of their size or flow patterns, do not offer sport fishing; they generally contain only minnows, darters, and other small baitfish.

Category B4 - Wetlands. As defined in Section 2.17. Stream criteria may not be appropriate for application to wetlands.

Category C - Water Contact Recreation. This category includes swimming, fishing, water skiing and certain types of pleasure boating such as sailing in very small craft and outboard motor boats.

Category D - Agriculture and Wildlife Uses.

Category D1 - Irrigation. This category includes all stream segments used for irrigation.

Category D2 - Livestock Watering. This category includes all stream segments used for livestock watering.

Category D3 - Wildlife. This category includes all stream segments and wetlands used by wildlife.

Category E - Water Supply Industrial, Water Transport, Cooling and Power. This category includes cooling water, industrial water supply, power production, commercial and pleasure vessel activity, except those small craft included in category C.

Category E1 - Water Transport. This category includes all stream segments modified for water transport and having permanently maintained navigation aides.

Category E2 - Cooling Water. This category includes all stream segments having one or more users for industrial cooling.

Category E3 - Power Production. This category includes all stream segments extending from a point 500 feet upstream from the intake to a point one half (1/2) mile below the wastewater discharge point.

Category E4 - Industrial. This category is used to describe all stream segments with one or more industrial users. It does not include water for cooling.

Special waters of the state include high quality waters, streams in the West Virginia Natural Streams Preservation system, and National Resource Waters (Wild and Scenic Rivers, waters in state and national forests, naturally reproducing trout streams, and national rivers).

There have not been any changes in water use classification since the last (1992) 305(b) report.

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PART III: SURFACE WATER ASSESSMENT

Chapter One: Summary Data

Methodology

Use support of the state's waters was determined using criteria established by EPA in the 305(b) guidelines (May, 1991). Waters are classified as fully, partially or not supporting. Fully supporting waters are those that do not exceed criteria in greater than 10 percent of measurements or do not have any pollution sources present that could interfere with the use. Partially supporting waters are those that exceed criteria in 11-25 percent of measurements, or that have pollution sources present that result in only partial attainment of the use. Waters classified as not supporting exceed criteria in greater than 25 percent of measurements, or have a magnitude of pollution sources likely to impair the use or exceed criteria.

Biological information was also used in the determination of use support. In some instances, interpretation of biological data would "override" the water quality criteria. For example, if an infertile stream exceeded the water quality standard for pH more than 25% of the time (i.e., not supporting) yet was found to support a higher quality biological community, then the stream would receive a higher use support classification. The professional judgement of state biologists was used in such instances.

The achievement of recreational use goals of the Clean Water Act is primarily based on the actual utilization of water contact recreation, with consideration given to fecal coliform bacteria and/or waterborne diseases. The State Bureau of Public Health has restricted recreational use in the past due to such reasons. However, no closures were reported by the Bureau during this reporting period. In many instances, professional judgement was utilized to determine recreational use support in streams impaired by raw and/or improperly treated sewage. In addition, streams were not considered suitable for water contact recreation if they were seriously impaired by toxicants such as acid mine drainage. If available, biological data also was considered in making use support determinations for waters containing toxicants. For example, if toxicants were detected one or more times in a three year period (i.e., not supporting), yet the waterbody supported a healthy population of aquatic life, then it was considered partially supporting.

Monitored assessments are based on current biological and/or chemical data. These data include ambient water quality data from various agencies, fishery surveys, benthic surveys, mussel surveys, and special studies. Water quality monitoring information from the Office's mini-network and the New River cooperative monitoring project also were utilized in this report.

Most water quality data used for this report was collected between 1991 and 1993. However, a small amount of data was reused from previous reporting periods. A number of streams suffering from chronic mine drainage problems, as well as a few streams monitored between 1989 and 1991 were carried over into this report.

Determining whether a stream or stream segment supports or partially supports a designated use involves more than just an evaluation of objective data. It is also based on interviews with professional staff both within and outside the agency, including biologists, inspectors, and permit engineers. Professional judgement by knowledgeable individuals is a valuable means of assessing a waterbody, particularly in cases where water quality data conflict, or are not comprehensive enough to truly indicate use support status.

Water Quality Summary

During the 1994 reporting period, a total of 6,370 miles of rivers and streams were assessed for designated uses. This is approximately 20 percent of the state's total stream mileage. Of the total stream miles assessed, 24 percent were fully supporting, 7 percent were fully supporting but threatened, 60 percent were partially supporting, and 9 percent were non-supporting. Information on overall use support for rivers and streams is contained in Table III-1.

Detailed information on individual designated uses for rivers and streams is provided in Table III-2. The current barometer used to assess overall stream health is the Aquatic Life Support use. As mentioned previously, the fishable goal of the Clean Water Act is now assessed in two parts: Aquatic Life Support and Fish Consumption Support. Of the total stream miles assessed for Aquatic Life Use, 34 percent were fully supporting, 7 percent were fully supporting but threatened, 50 percent were partially supporting, and 9 percent were non-supporting. Of the total stream miles assessed for Fish Consumption Use, 23 percent were fully supporting, 76 percent were partially supporting, and 1 percent were non-supporting. The Fish Consumption Use data may be somewhat misleading since, as a general rule, only streams suspected to be contaminated are normally sampled for this use. Due to this biased sampling design, the results will more often than not indicate an impaired stream condition.

The swimmable goal of the CWA, like the fishable goal, also is assessed in two parts: Swimmable Use and Secondary Contact Recreation Use. Of the total stream miles assessed for the Swimmable Use, 75 percent were fully supporting, <1 percent were fully supporting but threatened, 16 percent were partially supporting, and 8 percent were non-supporting. No streams were assessed for Secondary Contact Recreation Use this reporting period because this use is not recognized in the state's water

Table III-1

Overall Designated Use Support Summary

Waterbody type: Rivers

Total number of assessed rivers: 464

Total number of monitored rivers: 410

Total number of evaluated rivers: 54

(All size units in miles)

Degree of use support	Evaluated	Monitored	Total
Fully supporting	85.24	1,442.30	1,527.54
Supporting but threatened	34.56	398.03	432.59
Partially supporting	152.42	3,669.50	3,821.92
Not supporting	99.97	487.88	587.85
Not attainable	0.00	0.00	0.00
Total size assessed	372.19	5,997.71	6,369.90
Not assessed	----	----	25,908.10

Table III-2

Use Support Matrix Summary Table

Waterbody type: Rivers

(All size units in miles)

Use	Supporting	Supporting but Threatened	Partially Supporting	Not Supporting	Not Attainable	Not Assessed
Overall use support	1,527.54	432.59	3,821.92	587.85	0.00	62.65
Aquatic life support	2,191.06	471.03	3,111.83	560.00	0.00	62.65
Fish consumption	154.95	0.00	499.56	4.00	0.00	0.00
Cold water fishery (Trout)	535.84	208.43	267.12	324.13	1.75	0.00
Warm water fishery	1,164.42	318.56	2,685.45	241.97	0.00	12.44
Contact recreation	707.44	0.00	337.50	103.00	0.00	0.00
Swimmable	4,789.42	18.00	1,044.30	505.50	0.00	62.56
Drinking water supply	2,119.36	0.00	20.00	226.91	72.00	38.15
Industrial use	340.00	0.00	0.00	0.00	0.00	0.00
Bait minnow fishery	287.55	79.85	585.21	269.75	0.00	15.77

quality standards. Generally, if the swimmable use for a stream is fully supporting, then the Clean Water Act swimmable goal is considered met.

Detailed information on state defined designated uses is provided in Table III-2. Additionally, use support information for lakes is contained in Part III of Chapter 3 of this report.

The stream identification system used for the waterbodies in West Virginia is an alpha-numeric system. Each river basin or major sub-basin is assigned a capital letter. The tributaries are numbered from the mouth to the headwaters consecutively and their tributaries lettered and numbered accordingly. The numbers used for stream identification are not mile points upstream, but represent the point in the order of the tributaries. Following is a table which may be used as a reference to aid in the correlation of stream code numbers with their respective river basins. The basin cataloging unit (reach file) numbers also are indicated to aid in cross referencing.

Basin Name	State Basin Code	Reach File Number
Big Sandy River	BS	05070204
Tug Fork	BST	05070201
Elk River	KE	05050007
Gauley River	KG	05050005
Cranberry River	KGC	05050005-046
Williams River	KGW	05050005-049
Greenbrier River	KNG	05050003
Guyandotte River	OG	05070101
Guyandotte River	OG	05070102
Mud River	OGM	05070102-020
Clear Fork	OGC	05070101-040
Kanawha River	K	05050006
Kanawha River	K	05050008
Coal River	KC	05050009

Pocatalico River	KP	05050008-018
Little Kanawha River	LK	05030203
Hughes River	LKH	05030203-011
Spring Creek	LKS	05030203-022
West Fork	LKW	05030203-030
Monongahela River	M	05020003
Cheat River	MC	05020004
Shavers Fork	MCS	05020004-011
Tygart River	MT	05020001
Buckhannon River	MTB	05020001-016
Middle Fork River	MTM	05020001-025
West Fork River	MW	05020002
New River	KN	05050002
Bluestone River	KNB	05050002-016
Ohio River	O	05030000
Ohio River	O	05090000
Middle Island Creek	OMI	05030201
Potomac River	P	02070003
Cacapon River	PC	02070003-013
North Branch	PNB	02070002
South Branch	PSB	02070001
Shenandoah River	S	02070004
Youghiogheny River	Y	05020006
James River	J	02080201

Causes and Sources of Nonsupport of Designated Uses

Cause/source information for streams that do not fully support designated uses is summarized in the following sections, while information pertaining to lakes may be found in Part III, Chapter 3.

Relative Assessment of Causes

The principal causes of major impacts to West Virginia's streams are siltation (1,080 miles), metals (1,007 miles), fecal coliform (710 miles), and pH (611 miles). These four parameters have historically had a significant impact on state streams. Additionally, priority organics (422 miles), turbidity (356 miles), and nutrients (297 miles) pose a major threat to state waters.

The chief causes of moderate/minor impacts to state streams are siltation (1,800 miles), metals (1,424 miles), fecal coliform (804 miles), and nutrients (655 miles). Additionally, pH (529 miles), organic enrichment (392 miles), and turbidity (182 miles) pose moderate/minor threats to state streams. A detailed summary of the various pollution causes for streams is provided in Table III-3.

Relative Assessment of Sources

The principal sources of major impacts to West Virginia's streams include coal mining (1,135 miles), urban runoff (460 miles), silviculture (453 miles), and combined sewer overflows (374 miles). Additional sources of major impacts to streams include general agriculture (333 miles), pasture land (292 miles), and petroleum activities (283 miles).

The largest sources of moderate/minor impacts to state streams are coal mining (1,176 miles), municipal point sources (997 miles), pasture land (842 miles), and general agriculture (729 miles). Additional sources of moderate/minor impacts include combined sewer overflows (539 miles), road construction/maintenance (494 miles), onsite wastewater systems (490 miles), and animal holding/management areas (463 miles). Detailed information on pollution source categories for streams is provided in Table III-4. In addition, a list of streams impaired by drainage from abandoned mine lands is provided in Appendix C. Drainage from abandoned coal mines poses a significant threat to water quality in West Virginia and warrants special recognition.

Table III-3

305(b) Relative Assessment of Causes

Sizes of waterbodies not fully supporting uses affected by various cause categories

Waterbody type: Rivers

(All size units in miles)

Cause Categories	Major Impact	Moderate/Minor Impact
Cause unknown	9.20	12.41
Unknown toxicity	0.00	16.03
Pesticide	277.00	0.00
Priority organics	441.85	0.00
Non-priority organics	5.41	2.92
Metals	1,006.84	1,424.08
Unionized Ammonia	5.60	10.04
Chlorine	2.00	9.16
Other inorganics	50.09	34.86
Nutrients	297.26	654.63
pH	611.45	528.87
Siltation	1,080.37	1,800.23
Organic enrichment/DO	174.34	392.09
Salinity/TDS/chlorides	0.00	34.67
Thermal modifications	9.14	25.27
Flow alteration	25.70	26.69
Other habitat alterations	11.60	5.00
Pathogens	0.00	0.00
Radiation	0.00	0.00
Oil and grease	5.63	14.48
Taste and odor	0.00	0.00
Suspended solids	0.00	5.00
Noxious aquatic plants	0.00	116.00
Filling and draining	1.50	6.00
Total toxics	77.60	0.00
Turbidity	355.60	181.50
Exotic species	0.00	0.00
Discoloration	0.00	3.15
Sludge deposits	0.00	4.90
Odor	0.00	0.00
Fecal coliform	710.10	803.76
Algal blooms	0.00	0.00

Table III-4

305(b) Relative Assessment of Sources

Sizes of waterbodies not fully supporting uses
affected by various source categories

Waterbody type: Rivers

(All size units in miles)

Source categories	Major impact	Moderate/Minor impact
Industrial point sources	240.87	397.48
Municipal point sources	192.13	996.98
Combined sewer overflow	373.55	539.28
Agriculture	332.62	728.51
Non-irrigated crop production	271.83	433.91
Irrigated crop production	0.00	0.00
Specialty crop production	0.00	0.00
Pasture land	291.78	842.07
Range land	0.00	0.00
Feedlots - all types	0.00	0.00
Aquaculture	0.33	4.73
Animal holding/management areas	28.20	463.34
Manure lagoons	0.00	0.00
Silviculture	252.82	271.94
Harvesting, restoration, residue management	0.00	0.00
Forest management	0.00	0.00
Road construction/maintenance	264.96	494.21
Construction	272.54	195.31
Highway/road/bridge	1.06	13.30
Land development	175.80	125.36
Urban runoff/storm sewers	459.76	310.86
Coal mining	1,135.14	1,176.14
Surface mining	0.00	0.00
Subsurface mining	0.00	0.00
Placer mining	0.00	0.00
Dredge mining	0.00	0.00
Petroleum activities	282.56	458.91
Mill tailings	0.00	0.00
Mine tailings	31.52	254.60
Land disposal	30.82	48.68
Sludge	0.00	0.00
Wastewater	0.00	0.00
Landfills	3.16	0.50
Industrial land treatment	0.00	1.75

Table III-4 continued

305(b) Relative Assessment of Sources

Sizes of waterbodies not fully supporting uses affected by various source categories

Waterbody type: Rivers

(All size units in miles)

Source categories	Major impact	Moderate/Minor impact
Onsite wastewater systems (septic tanks)	119.50	490.33
Hazardous waste	0.00	0.00
Septage disposal	0.00	0.00
Hydromodification	6.83	35.95
Channelization	0.00	5.00
Dredging	0.00	0.00
Dam construction	0.00	0.00
Flow regulation/modification	0.00	0.00
Bridge construction	0.00	0.00
Removal of riparian vegetation	0.00	13.80
Streambank modification/ destabilization	55.18	130.36
Drainage/filling of wetlands	0.00	5.00
Other	5.77	21.14
Domestic sewage	240.46	402.77
Atmospheric deposition	215.36	341.68
Waste storage/storage tank leaks	0.00	1.75
Highway maintenance and runoff	0.00	149.36
Spills	8.57	0.00
In-place contaminants	19.45	0.00
Natural	2.80	95.80
Recreational activities	0.00	4.25
Upstream impoundment	0.50	0.00
Salt storage sites	0.00	0.00
Source unknown	71.70	198.06
Beaver activity	3.00	0.00

Chapter Two: Public Health/Aquatic Life Concerns

Size of Waters Affected by Toxics

In general, only a small percentage of state waters are monitored for toxics in any given year, primarily due to the high cost of the analytical work. Also, toxics monitoring is rarely performed in random fashion, as many of the lakes and streams monitored for toxics are already suspected of being impaired. Many conventional pollutants, which are known to produce toxic effects, are monitored through the state's ambient network. In actuality, any chemical parameter may produce a toxic effect if present at a high enough concentration. However, for purposes of this discussion, toxics monitoring only refers to streams sampled for priority pollutants listed in Section 307 of the Clean Water Act.

Toxic pollutants included in the state water quality criteria established by the Water Resources Board are monitored in a variety of ways. One method involves analyzing the water column through ambient networks, such as those maintained by the Office of Water Resources, ORSANCO, and U.S. Army Corps of Engineers. Toxics monitoring also is performed through the Office's compliance sampling and toxicity testing programs. A self-monitoring program also is administered by way of the Office's NPDES permitting system. This self-monitoring program requires permittees to submit water quality information, including toxics, to the Office on a weekly or monthly basis. When appropriate, pollutant "action levels" established by the U.S. Food and Drug Administration are utilized, particularly in the development of fish consumption advisories.

The State Water Resources Board has adopted numeric criteria for the following toxic pollutants (effective August 20, 1990):

Ammonia	Chlorine, Total Residual
Antimony	Chlordane
Arsenic	DDT
Barium	Aldrin-Dieldrin
Beryllium	Endrin
Cadmium	Toxaphene
Copper	PCB
Cyanide	Methoxychlor
Hexavalent Chromium	Benzene
Lead	Hexachlorobenzene
Mercury	Chloroform
Nickel	1,2-dichloroethane
Phenolic Material	1,1,1-trichloroethane
Selenium	1,1,2,2-tetrachloroethane
Silver	1,1-dichloroethylene
Thallium	Trichloroethylene
Zinc	Tetrachloroethylene
Toluene	Phthalate Esters
Carbon Tetrachloride	Polynuclear Aromatic Hydrocarbons
Halomethanes	

A summary of state waters monitored for toxics may be found in Table III-5. This summary shows that elevated levels of toxics were present in 491 stream miles and 7,810 acres of lakes. These totals do not reflect streams impacted by acid mine drainage (more than 2,800 stream miles). It is important to note that toxics monitoring is usually only conducted on waters that are already suspected of being impaired. Because of this, it is erroneous to make general assumptions concerning the extent of toxic contamination in state waters.

The identification and characterization of toxic pollution problems is enhanced by a fish tissue monitoring program administered by the Office of Water Resources. The fish tissue sampling program is used to measure substances not readily

Table III-5

Summary of Total Waterbody Size Affected by Toxics

Waterbody type/units	Size monitored for toxics	Size with elevated levels of toxics
Rivers (miles)	1,169.45	490.60
Lakes (acres)	14,986.00	7,810.10
Estuaries	0.00	0.00
Fresh wetlands	0.00	0.00
Oceans	0.00	0.00
Great Lakes	0.00	0.00
Coastal waters	0.00	0.00
Tidal wetlands	0.00	0.00

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. During a typical year, samples for metals, pesticides, and other organics are collected from 20 to 25 sites (two samples per site, each comprised of five fish) throughout the state.

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 III-6.

The eight streams with current fish consumption advisories comprise a total affected area of 439 miles. All advisories listed in the 1992 report have undergone either revision or reissuance. Reissued advisories include those on following streams: Kanawha River (dioxin), Ohio River (chlordane, PCB's), Shenandoah River (PCB's), and Flat Fork Creek (PCB's). Advisories that have undergone revision include the following: Pocatalico River and Armour Creek (dioxin), revised from all fish to bottom feeders only; and Potomac and North Branch Potomac rivers (dioxin), revised from bottom feeders to non-sport fish.

Information on public drinking water supply/bathing beach closures was obtained from the state Department of Health. During this reporting period, no bathing beach closures were documented. However, 10 public water supplies were closed on a total of 29 separate occasions. The principal pollutants forcing these closures were diesel fuel (from truck wrecks), turbidity (from coal mining and natural sources), and raw sewage (from CSO's and malfunctioning POTW's). Information pertaining to water supply closures is detailed in Table III-7.

Table III-6

Toxic Contamination/Public Health Impacts
Category of Impact: **Fish Consumption Advisories**

Name of Waterbody (Code)	Pollutant(s) of Concern	Source(s) of Pollutant(s)	Size Affected (miles)	Comments
Kanawha River (O-20)	Dioxin	Unknown	46.00	Issued 3-1-86 Bottom Feeders Reissued 4-06-94
Pocatalico River (K-29)	Dioxin	Unknown	2.00	Issued 3-1-86 All Fish Revised 4-06-94 Bottom Feeders
Armour Creek (K-30)	Dioxin	Unknown	2.00	Issued 3-1-86 All Fish Revised 4-06-94 Bottom Feeders
Ohio River (O)	Chlordane, PCB's	Unknown	277.00	Issued 9-07-89 Catfish and Carp Reissued 8-94
Shenandoah River (S)	PCB's	Avtex, Front Royal, VA	19.45	Issued 9-7-89 All Fish Revised 1-24-90 Channel Catfish, Suckers, Carp Reissued 4-06-94
North Br. Potomac (P-20)	Dioxin	Westvaco Pulp Mill, Luke Md.	50.50	Issued 9-7-89 Bottom Feeders Revised 10-30-92 Non-sport Fish
Potomac River (P)	Dioxin	Westvaco Pulp Mill, Luke Md.	38.00	Issued 9-7-89 Bottom Feeders Revised 10-30-92 Non-sport Fish
Flat Fork Creek (KP-33)	PCB's	Spencer Transformer Harmony, WV	5.00	Issued 2-4-91 Suckers, Carp Channel Catfish Reissued 4-06-94

Table III-7
Toxic Contamination/Public Health Impacts
Category of Impact: **Water Supply Closure**

Name of Waterbody (Code)	Pollutant(s) of Concern	Source(s) of Pollutants	Number of Closures	Comments
Opequon Creek & Potomac River (P-4 & P)	Raw Sewage	Opequon-Hedgesville STP	N/A	Contaminated water advisory issued 5/01/93 & 3/16/94
Opequon Creek (P-4)	Non-disinfected Sewage	Opequon-Hedgesville STP	N/A	Swimming, boating, water plant intake advisory issued 3/01/92-3/30/92 for Potomac River & Chesapeake Bay
Potomac River (P)	Raw Sewage	CSO's Cumberland, MD	1	Town of Paw Paw advised not to pump raw water, Date Unknown
West Fk./ Pond Fk. (KC-10-U-7)	Turbidity	Natural	2	Van PSD
Coal River (K-34)	Turbidity	Coal Mining	4	Whitesville Water
Mill Creek (O-32)	Information Unavailable	Information Unavailable	1	Ripley Water Dept
Kanawha River (O-20)	Diesel Fuel	River Barges	6	Cedar Grove Water
Elk River (WVK-43)	Diesel Fuel, Anti-freeze	Tanker Truck	1	WV-American Water Co.
Guyandotte River (O-4)	Unknown	Truck Wreck	2	Logan Co. PSD-Greenville
Guyandotte River (O-4)	Diesel Fuel	Truck Wreck	7	Man Water
Tug Fork (BST)	Diesel Fuel	Truck Wreck	1	Matewan Water
Poplar Fk. (K-12-F)	Minor Spills	Information Unavailable	4	South Putnam PSD

Information pertaining to pollution-caused fish kills is maintained by the Division of Natural Resources' Wildlife Resources Section. The nature and extent of the fish kill is determined by the district fishery biologist, often in cooperation with the local Water Resources inspector. Cause, severity, and area affected are extremely variable. During this reporting period, fish kills occurred in 31 streams affecting 69.99 miles, and one lake (affected acreage undetermined). A combined total of 121,762 fish (both game and non-game) were killed. This represents a significant increase in both the number of incidents and fish killed compared with the 1989-1991 reporting period. Table III-8 may be referenced for additional details. In accordance with the 305(b) guidance, the remaining impacts are addressed briefly:

Fish tissue contamination - Coincides with advisories.
Fishing ban in effect - None.
Pollution-related fish abnormalities - None observed.
Shellfish restrictions - Not applicable.
Sediment contamination - No information obtained during reporting period.
Bathing area closure(s) - None reported.
Waterborne disease incident(s) - None reported.

West Virginia is keenly aware of the current emphasis on the protection and monitoring of wetlands. The State is active in wetlands protection (see Part III, Chapter 5); However, it has not been able to establish any actual wetlands monitoring program, particularly as it would relate to public health/aquatic life concerns. Currently, aquatic life concerns are addressed through habitat protection.

Section 303(d) Waters

Table III-9 provides an update of the State's 303(d) stream list. These water quality limited waters are streams that do not, or are not expected to, meet applicable water

Table III-8

Toxic Contamination/Public Health Impacts
Category of Impact: **Fish Kills**

Name of Waterbody (County)	Pollutant(s) of Concern	Source(s) of Pollutant(s)	Size Affected (miles)	Comments
Tuscarora Creek (Berkley)	Inorganic Chemical	Martinsburg STP	1.50	1-21-91, total kill, 80 fish
Hurricane Creek (Putnam)	Inorganic Chemical	STP Construction	1.00	7-2-91, total kill, 87 fish
Reeds Creek (Pendle-ton)	Green Concrete	Aquaculture Operation	0.33	7-24-91, total kill, 2,045 fish
Kelleys Creek (Kanawha)	Dewatered Stream	Coal Mining	1.00	8-23-91, total kill, 1,197 fish
Paw Paw Creek (Marion)	Raw Sewage	Grant Town STP	0.25	8/18-19/91, total kill, 1,151 fish
Sugarcamp Run (Tyler)	Organic Chemical	Union Carbide Plant	0.06	11-25-91, total kill, 45 fish
Simpson Creek (Harrison)	Raw Sewage	Bridgeport STP	1.50	8-10-91, total kill, 670 fish
Bull Creek (Wayne)	Petroleum	Leaking Tanker Truck	1.90	2-4-92, total kill, 3,398 fish
Board Tree Run & Grapevine Creek (Kanawha)	Industrial Chemical	Leaking Drum	4.65	2-21-92, total kill, 25,543 fish

Table III-8 continued...

Toxic Contamination/Public Health Impacts
Category of Impact: **Fish Kills**

Name of Waterbody (County)	Pollutant(s) of Concern	Source(s) of Pollutant(s)	Size Affected (miles)	Comments
Left Fk./ Buckhannon River (Randolph & Upshur)	Industrial Chemical	Coal Mining	7.00	5-14-92, total kill, 4,338 fish
West Fk./ Pond Fork (Boone)	Industrial Chemical	Coal Mining	6.50	5-21-92, total kill, 1,854 fish
Two Mile Creek (Wayne)	Industrial Chemical	Cabot Oil & Gas	1.00	7-16-92, total kill, 225 fish
Right Fk./ Lynn Creek (Wayne)	Corn Syrup	Leaking Tank Truck	0.50	7-18-92, total kill, 3,142 fish
Limestone Branch, Fisher Branch & Rocky Fork (Kanawha)	Pesticide	Dodson Bro.'s Exterminating	2.20	7-24-92, total kill, 5,086 fish
Chenoweth Creek (Randolph)	Green Concrete	Bridge Construction	0.40	7-15-92, total kill, 100 fish
Rush Run (Roane)	Industrial Chemical	Pennzoil Corporation	2.30	8-21-92, total kill, 1,912 fish
Ann Moore Run (Harrison)	Industrial Chemical	Union Carbide	0.50	10-15-92, total kill, 796 fish
East Fk./ Twelvepole Creek (Wayne)	Industrial Chemical	Strip Mine Reclamation	1.00	5-17-93, total kill, 1,246 fish

Table III-8 continued...

Toxic Contamination/Public Health Impacts
Category of Impact: **Fish Kills**

Name of Waterbody (County)	Pollutant(s) of Concern	Source(s) of Pollutant(s)	Size Affected (miles)	Comments
Bluestone River (Mercer)	Pesticide	Railroad Spraying	1.40	6-11-93, total kill, 23,464 fish
Cedar Creek (Wyoming)	Sediment	Coal Mine Reclamation	2.20	6-16-93, total kill, 58 fish
Pond Fork (Boone)	Industrial Chemical	Coal Mining	15.40	6-20-93, total kill, 4,078 fish
Grass Lick Run/Grass Lick Creek (Jackson)	Petroleum	Go Mart	4.00	6-23-93, total kill, 11,299 fish
Campbells Creek (Kanawha)	Chlorine	Water Line Construction	0.50	6-28-93, total kill, 1,717 fish
Little Birch River (Braxton)	Industrial Chemical	Coal Mines	0.60	6-29-93, total kill, 813 fish
Stonecoal Creek (Lewis)	Unknown	Unknown	1.50	6-29-93, total kill, 218 fish
Black Fork (Tucker)	Acid Mine Drainage	AML Contractor	6.30	7-12-93, total kill, 22,093 fish
Laurel Fork (Mingo)	Industrial Chemical	Coal Mining	2.50	7-14-93, total kill, 2,349 fish
Scary Creek (Putnam)	Pesticide	Orkin Corporation	0.50	7-16-93, total kill, 1,252 fish

Table III-8 continued...

Toxic Contamination/Public Health Impacts
Category of Impact: **Fish Kills**

Name of Waterbody (County)	Pollutant(s) of Concern	Source(s) of Pollutant(s)	Size Affected (miles)	Comments
R.D. Bailey Lake (Wyoming)	Unknown	Unknown	Acreage Un-determined	9-15-93, total kill, 1,200 fish
Kelleys Creek (Kanawha)	Industrial Chemical	Mine Salvage Operation	1.50	9-21-93, total kill, 306 fish

Table III-9
West Virginia
1994 303(d) Stream List
Water Quality Limited Waters

(Note: Streams are listed in order of priority)

STREAM NAME	CODE	MILES	SOURCE(S)	POLLUTANT(S) OF CONCERN
1. Stony River	PNB-17	24.50	Mine Drainage, Power Plant	Metals, pH, Nitrogen, Thermal
2. Middle Fork River	MT-33	20.80	Mine Drainage, Silviculture, Petroleum Activ.	Metals, pH, Turbidity
3. Blackwater River	MC-60-D	34.40	Mine Drainage	Metals, pH
4. West Fork River	M-26	103.00	Mine Drainage, Dom. Sewage, CSO's, Urban Runoff, Metals Tailings	Metals, D.O., Fecal coli
5. North Branch Potomac River	P-20	50.00	Mine Drainage, Paper Mill	Metals, pH, Nutrients
6. Dunloup Creek	KN-22	15.80	Mine Drainage, Urban Runoff, Domestic Sewage	Metals, pH, Fecal Coli, Nutrients
7. Ten Mile Creek	MTB-25	5.40	Mine Drainage, Domestic Sewage	Metals, pH, Fecal Coli
8. Paint Creek	K-64	34.71	Mine Drainage, Channelization, Highway Runoff	Metals, pH
9. Buckhannon River	MT-31	46.74	Mine Drainage, Highway Runoff	Metals, pH
10. Ohio River	O	277.00	Unknown	Chlordane, PCB's
11. Potomac River	P	38.00	Westvaco Pulp Mill Luke, MD	Dioxin

Table III-9
West Virginia
1994 303(d) Stream List
continued

STREAM NAME	CODE	MILES	SOURCE(S)	POLLUTANT(S) OF CONCERN
12. Kanawha River	O-20	67.60	Unknown	Dioxin
13. Guyandotte River	O-4	102.00	Mine Drainage	Metals
14. New River	K-81	87.00	Unknown	Cadmium
15. Tygart River	M-27	85.00	Mine Drainage	Metals, pH
16. Monongahela River	M	37.50	Mine Drainage	Metals
17. East Fork/ Twelvepole Creek	O-2-Q	24.30	Mine Drainage	Metals, pH
18. Shenandoah River	S	19.45	Avtex Fibers Front Royal, VA	PCB's
19. Heizer Creek	KP-1	9.18	Mine Drainage	Metals, pH
20. Charley Creek	OGM-14	8.70	Sycamore Landfill Hurricane, WV	Metals
21. Manilla Creek	KP-1-A	7.37	Mine Drainage	Metals, pH
22. Turkey Run	MTB-10	7.04	Buckhannon Landfill Buckhannon, WV	Metals
23. Buffalo Creek	BST-31	5.64	Mingo Co. Landfill Williamson, WV	Metals
24. Wiggins Run	P-14-A	3.42	Morgan Co. Landfill Berkeley Sprgs., WV	Metals
25. Conner Run	O-77-A	3.16	Ohio Power Moundsville, WV	Metals

Table III-9
West Virginia
1994 303(d) Stream List
continued

STREAM NAME	CODE	MILES	SOURCE(S)	POLLUTANT(S) OF CONCERN
26. Ices Run	M-23-A	3.10	Mine Drainage	Metals
27. Dry Run	LK-3	3.05	Northwestern Landfill Parkersburg, WV	Metals
28. Buffalo Creek	M-23	3.00	Mine Drainage	Metals
29. Ford Run	MT-27	2.70	Mine Drainage	Metals, pH
30. Buzzard Run	P-4-H	2.58	Corning Glass Martinsburg, WV	Arsenic
31. Gregory Run	MW-13-D	2.40	Mine Drainage	Metals
32. Dry Monday Branch	BST-70-M-2-B-1	2.35	Mine Drainage	Metals
33. Pocatalico River	K-29	2.00	Unknown	Dioxin
34. Armour Creek	K-30	2.00	Unknown	Dioxin
35. East Fork/ Greenbrier River	KNG-78	1.75	Howe's Leather Frank, WV	Phenols, Nitrite
36. Jarrett Branch	K-75	1.58	Elkem Metals Alloy, WV	Metals, pH
37. Rich Fork/ Two Mile Creek	K-41-D.5	1.52	Don's Disposal Charleston, WV	Metals
38. Lick Branch/ Kanawha River	K-45	1.15	City of Charleston Landfill Charleston, WV	Metals

Table III-9
West Virginia
1994 303(d) Stream List
continued

STREAM NAME	CODE	MILES	SOURCE(S)	POLLUTANT(S) OF CONCERN
39. Unnamed Tributary Wolf Run of Tannery Run	O-57.5-A	1.00	Quaker State (Mid Atlantic Fuel) St. Mary's, WV	Chloride, Arsenic
40. Pats Branch	BST-40-E	0.87	Inco Alloys Huntington, WV	Metals
41. Unnamed Tributary Tannery Run	O-57.5	0.80	Quaker State (Mid-Atlantic Fuel) St. Mary's, WV	Chloride, Arsenic
42. Harmon Creek	O-97	0.80	Weirton Steel Weirton, WV	Temperature, Iron
43. Unnamed Tributary Monongahela River	M-23.5	0.50	Sharon Steel Fairmont, WV	Iron
44. Cheat Lake	M(L)-2-(1)	1730 acres	Mine Drainage	Metals, pH, Siltation
45. Summit Lake	KG(L)-34-H-5-(1)	43 acres	Atmospheric Dep, Natural Acidity	pH, Metals
46. Mount Storm Lake	PNB(L)-17-(1)	1200 acres	Industrial Point Source, Mine Drainage	Thermal, pH
47. Tomlinson Run Lake	O(L)-102-(1)	30 acres	Agriculture, Construction	Siltation, Organic Enrichment
48. Laurel Lake	BST(L)-24-E-(1)	29 acres	Mine Drainage	Siltation
49. Hurricane WS Reservoir	K(L)-22-(1)	12 acres	Domestic Sewage, Construction, Urban Runoff	Nutrients, Siltation, Metals
50. Turkey Run Lake	O(L)-37-(1)	15 acres	Petroleum Activities	Siltation, Metals

Table III-9
West Virginia
1994 303(d) Stream List
continued

STREAM NAME	CODE	MILES	SOURCE(S)	POLLUTANT(S) OF CONCERN
51. Bear Rocks Lake	O(L)-88-D-2-F-(1)	8 acres	Agriculture, Construction	Nutrients, Siltation, Organics
52. Castleman Run Lake	O(L)-92-L-(1)	22 acres	Agriculture	Siltation
53. Saltlick Pond #9	K(L)-95-(1)	15 acres	Silvicuture, Petroleum Activities	Metals, Siltation
54. Burches Run Lake	O(L)-83-C-(1)	16 acres	Agriculture, Domestic Sewage	Metals, Nutrients, Siltation
55. Mountwood Park Lake	LK(L)-10-(1)	48 acres	Construction, Streambank Mod, Highway Maintenance	Siltation
56. Ridenour Lake	K(L)-30-A-(1)	27 acres	Domestic Sewage, Construction, Agriculture, Urban Runoff	Nutrients, Metals, Siltation

NOTE: This 303(d) list includes all water quality limited waters in West Virginia for which there is sufficient data to make such a determination. Although many other streams and lakes in the state have been assessed as less than fully supporting designated uses, such assessments were made based upon limited data.

As a general rule, less than fully supporting waters were not included in the 303(d) list if the assessment was based primarily upon:

1) Best professional judgement
2) Citizen collected data
3) Monitoring data greater than five years old
4) Cursory monitoring data (i.e., limited parameters or infrequent sampling)

Mine drainage impacted streams (477) are included as a sublist to the primary 303(d) list (see Appendix C). Twenty-three of these mine drainage impacted streams also appear on the primary list. These are streams of special concern for which TMDL's will be developed.

quality standards with technology based controls alone. The current 303(d) list contains 56 waterbodies (43 streams and 13 lakes). The 43 streams comprise 1,151 miles while the 13 lakes total 3,195 acres. The 56 waterbodies are listed in order of priority.

Although any waterbody not fully supporting its designated uses is a candidate for inclusion on the 303(d) list, the state included only those waterbodies for which it had sufficient data to determine the existence of a water quality limited condition.

In addition to the primary 303(d) list, a secondary list was developed which includes all streams in the state impaired by mine drainage. The mine drainage impacted stream inventory (477 streams) is included in Appendix C. Twenty-three of these mine drainage impacted streams are of special concern, thus they also are included on the primary 303(d) list.

The state will pursue the development of TMDL's (Total Maximum Daily Loads) for a subset of its water quality limited streams.

Chapter Three: Lake Water Quality Assessment

Background

Data for this reporting period was derived primarily from DEP's 1993 lake water quality assessment (LWQA). For the 1993 assessment, 20 select public lakes were sampled three times...one each in spring, summer, and fall. The 20 lakes sampled included 10 of the original 13 priority lakes plus a subset of 10 of the remaining 70 non-priority lakes. The three priority lakes which were not sampled were undergoing either Phase I or II monitoring, thus DEP did not see any point in duplicating those efforts.

Data for ten U.S. Army Corps or Engineers' Reservoirs also was evaluated as part of this assessment. This data was obtained from Corps district offices.

In addition to in-lake monitoring, sampling also was conducted on 25 tributary inflows in order to obtain a better understanding of tributary water quality.

The assessment objectives remain consistent with those established for the 1989 LWQA. These are:

1) To enhance the current database of lake water quality information.
2) To establish solid baseline data from which to perform future trend analysis.
3) To determine the trophic status of all publicly owned lakes.
4) To establish a list of priority lakes to target for future restoration.

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. A list of sample parameters is provided in Table III-10.

Table III-10

Sample Parameters for 1993 WV Lake Water Quality Assessment

Lakes

Nitrate-Nitrite Nitrogen	Aluminum
Orthophosphorous	Iron
Suspended Solids	Manganese
Alkalinity	Temperature
Acidity	PH
Ammonia Nitrogen	Dissolved Oxygen
Total Kjeldahl Nitrogen	Conductivity
Total Phosphorous	Chlorophyll A
Secchi Depth	

Tributaries

Nitrate-Nitrite Nitrogen	Aluminum
Orthophosphorous	Iron
Suspended Solids	Manganese
Alkalinity	Temperature
Acidity	PH
Ammonia Nitrogen	Dissolved Oxygen
Total Kjeldahl Nitrogen	Conductivity
Total Phosphorous	

By state definition, a significant publicly owned lake is any lake, reservoir, or pond owned by a government agency or public utility, where recreational access is readily provided to the general public. Although not eligible for Clean Lakes funding, the U.S. Army Corps of Engineers' reservoirs are still considered significant publicly-owned lakes.

Presently, there are 93 publicly owned lakes in West Virginia, totalling 21,522.50 surface acres. The current inventory of lakes is presented in Appendix D-1. A list of priority lakes in order of ranking is provided in Table III-11.

Trophic Status

A trophic status summary for West Virginia's public lakes is included in Table III-12. Of the 78 lakes assessed for trophic status during this reporting period, 31 (40 percent) were classified as eutrophic (fertile), 29 (37 percent) were mesotrophic (moderately fertile), and 18 (23 percent) were oligotrophic (infertile). Fifteen lakes were not evaluated for trophic status due to insufficient data. 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 in 1993, trophic state indices were determined utilizing summer chlorophyll A, total phosphorus, and secchi depth. Correlation was generally good among the three parameters; however, values calculated from secchi depth

TABLE III-11

West Virginia Priority Lakes

OBS	NAME	CODE	PROBLEM	ACRES	USE*
1	Cheat Lake	M(L)-2-(1)	Acid Mine Drainage	1730	N
2	Summit Lake	KG(L)-34-H-5-(1)	Natural Acidity	43	P
3	Mount Storm Lake	PNB(L)-17-(1)	Acid Mine Drainage	1200	P
4	Tomlinson Run Lake	O(L)-102-(1)	Siltation	30	P
5	Laurel Lake	BST(L)-24-E-(1)	Siltation	29	P
6	Hurricane Lake/W S Res	K(L)-22-(1)	Siltation	12	P
7	Turkey Run Lake	O(L)-37-(1)	Siltation	15	P
8	Bear Rocks Lake	O(L)-88-D-2-F-(1)	Siltation	8	P
9	Castleman Run Lake	O(L)-92-L-(1)	Siltation	22	P
10	Saltlick Pond Number 9	LK(L)-95-(1)	Siltation	137	P
11	Burches Run Lake	O(L)-83-C-(1)	Siltation	16	P
12	Mountwood Lake	LK(L)-10-(1)	Siltation	48	P
13	Ridenour Lake	K(L)-30-A-(1)	Siltation	27	P
				====	
			Total	3317	

* N = Not Supporting
  P = Partially Supporting

Table III-12

Trophic Status Summary for Publicly-Owned Lakes in West Virginia

Trophic Status *	Number of Lakes	Percent
Hypereutrophic	0	0
Eutrophic	31	40
Mesotrophic	29	37
Oligotrophic	18	23
Assessed	78	83
Not Assessed	15	17
Totals	93	100%

* Based upon the trophic state indices devised by Carlson (1976).

were not considered accurate in lakes with high non-algal turbidity (i.e., muddy lakes).

Trophic state indices for non-priority lakes sampled between 1989 and 1992 were determined from either winter total phosphorus or summer secchi depth data. Since only a limited amount of data was available for trophic status assessment of these lakes, the results should be viewed with some degree of caution. More data collection will be necessary in order to increase the level of confidence in the trophic status assessment of non-priority lakes.

Control Methods

Currently, few procedures for pollution control are being utilized specifically to improve lake water quality. Point source pollution, both industrial and municipal, is controlled primarily through the NPDES permitting process. Only two lakes, Cheat and Mount Storm, receive direct industrial discharges. Municipal discharges (i.e., package plant) are present on many of the U.S. Army Corps of Engineer impoundments, as well as on Cheat Lake.

In general, the Office of Water Resources is reluctant to allow municipal discharges into public lakes, especially the smaller impoundments. Currently, there are no discharges, either municipal or industrial, into any public lakes smaller than 630 surface acres. Although few lakes overall contain direct point source discharges, discharges into feeder streams above reservoirs may potentially affect lake water quality. Many of the state's smaller impoundments and a few of the larger ones are impacted to varying degrees by domestic sewage discharges in their respective watersheds.

Overall, nonpoint source pollution has a far greater effect on West Virginia's public lakes than point source pollution. Unfortunately, there are few nonpoint source control projects specifically designed to benefit lakes. One such project exists at Laurel Lake in Mingo County where stormwater management along with sedimentation basins are being employed to reduce the effects of runoff from surface mining. In addition, two nonpoint source demonstration projects funded under Section 319 have been designed to help improve water quality at two of the state's priority lakes, Hurricane and Tomlinson Run. Agricultural and construction best management practices (BMP's) are being employed in these watersheds in an effort to curb runoff pollution.

In July, 1992, the state initiated a NPDES stormwater permitting program. This program requires that a permit be obtained by any individual disturbing three acres or more of land during a construction related activity. Contingent upon receiving the permit, an individual must submit and have approved by DEP a Stormwater Pollution Control Plan. For land disturbances under three acres, no permit is required. However, an individual responsible for construction activity still must not violate state turbidity standards. All individuals are encouraged to submit stormwater control plans, regardless of the size of the project. With the enactment of the stormwater permitting program and a new erosion control law for the timber industry, agriculture remains the only nonpoint source activity not governed by some type of pollution control regulation.

The state Water Resources Board is responsible for promulgating water quality criteria to protect the state's streams. Stream criteria also are applicable to lakes, since there are currently no standards specifically designed to protect lake water quality.

Restoration Efforts

Prior to 1989, the Office of Water Resources did not have a formal lake management program. Before the current Clean Lakes Program was initiated, lake management was primarily a function of the DNR's Wildlife Resources Section and focused mainly on management of fisheries.

The current management program will focus on restoring the state's most degraded lakes. Sampling conducted as part of the general lake water quality assessment will enable the state to determine the causes and magnitude of pollution problems associated with public lakes. Once the assessment data establishes the water quality status, an attempt will be made to determine the contributing sources. This will involve field investigations of the contributing watersheds, review of existing ambient water quality data, examination of existing land uses, and identification of point and nonpoint source impacts. This information will provide a basis for identifying those lakes for which additional funding support through phase I, II and III grants could be requested. The Office of Water Resources will offer guidance and technical support to any state or local agency sponsoring a lake related project. If Clean Lakes funding is involved, the Office will act as a liaison between the local sponsor and EPA.

Restoration Methods

Many methods are currently being utilized to restore the water quality of public lakes. In lakes affected by high acidity, liming is routinely employed to neutralize pH. This technique has been utilized in Summit, Boley, Spruce Knob, and Mt. Storm lakes. In lakes with aquatic vegetation problems, chemical controls (i.e., aquatic herbicides) are sometimes utilized. Grass carp also have been employed as a biological control in at least one lake (Warden). At Mountwood Park Lake, winter drawdown has been implemented in an effort to freeze the sediments and destroy certain aquatic plant species. Dredging is periodically conducted in a number reservoirs affected by high siltation. At one U.S. Army Corps of Engineers' Reservoir (Beech Fork), artificial circulation with destratification fans is currently being used in an effort to improve water quality by increasing dissolved oxygen levels in the bottom waters.

Experience has shown that it is always best to focus on controlling pollution at the source rather than combatting it once it has occurred. In realization of this fact, the main focus of all state lake management efforts will be on pollution source control.

To date, the state has overseen the completion of two Phase I diagnostic-feasibility studies, one at Mountwood Park Lake in Wood County and the other at Hurricane Lake in Putnam County. Both lakes are impaired by sedimentation. Two additional Phase I studies are near completion. One is at Tomlinson Run Lake in Hancock County and the other at Summit Lake in Greenbrier County. Tomlinson Run Lake is impaired by siltation while Summit Lake suffers from natural acidity.

To date, two Phase II projects have been funded. One at Mountwood Park Lake and the other at Hurricane Lake. The Mountwood Park project is ongoing with completion scheduled for December, 1994. The Hurricane Phase II project will be initiated in the spring of 1995.

Impaired and Threatened Lakes

The overall designated use support status for public lakes is presented in Table III-13. Of the 21,522 lake acres assessed, 2,282 (11 percent) fully supported their designated uses, 4,504 (21 percent) were fully supporting but threatened, 13,006 (60 percent) were partially supporting, and 1,730 (8 percent) were non-supporting.

A summary of specific designated uses is provided in Table III-14. This table includes information formerly reported in a separate table depicting the attainment of fishable/swimmable goals of the Clean Water Act. The fishable goal is now reported under two categories: aquatic life support and fish consumption. The swimmable goal also is reported under two categories: swimming and secondary contact recreation. Prior to the 1992 reporting period, the state was very lenient in

Table III-13

Overall Designated Use Support Summary

Waterbody type: Lakes

Total number of assessed lakes: 93

Total number of monitored lakes: 91

Total number of evaluated lakes: 2

(All size units in acres)

Degree of use support	Evaluated	Monitored	Total
Fully supporting	3.10	2,279.30	2,282.40
Supporting but threatened	0.00	4,504.00	4,504.00
Partially supporting	2.00	13,004.10	13,006.10
Not supporting	0.00	1,730.00	1,730.00
Not attainable	0.00	0.00	0.00
Total size assessed	5.10	21,517.40	21,522.50
Not assessed	0.00	0.00	0.00

Table III-2

Use Support Matrix Summary Table

Waterbody type: Lakes

(All size units in acres)

Use	Supporting	Supporting but Threatened	Partially Supporting	Not Supporting	Not Attainable	Not Assessed
Overall use support	2,282.40	4,504.00	13,006.10	1,730.00	0.00	0.00
Aquatic life support	2,283.90	4,504.00	13,004.60	1,730.00	0.00	0.00
Fish consumption	91.00	0.00	0.00	0.00	0.00	0.00
Cold water fishery (Trout)	1,016.50	2,725.00	121.60	0.00	0.00	0.00
Warm water fishery	2,117.40	4,479.00	12,925.45	1,730.00	0.00	0.00
Secondary contact recreation	21,475.00	0.00	47.50	0.00	0.00	0.00
Swimmable	21,522.50	0.00	0.00	0.00	0.00	0.00
Drinking water supply	5,037.00	1,750.00	0.00	0.00	0.00	0.00
Industrial use	1,980.00	0.00	0.00	0.00	0.00	0.00
Wildlife	38.00	0.00	0.00	0.00	0.00	0.00

its assessment of the Clean Water Act fishable goal. Generally, any lake that supported what was judged to be an adequate population of game fish was considered to fully support the fishable goal, regardless of the water quality status. For the current reporting period, however, water quality status is an important component in the overall assessment of the fishable goal. Under current federal guidelines, violations of state water quality criteria above a certain frequency level are automatically assumed to affect a lake's fishability.

For the aquatic life support use, 2,284 (11 percent) of the lake acres assessed were fully supporting, 4,504 (8 percent) were fully supporting but threatened, 13,005 (60 percent) were partially supporting, and 1,730 (8 percent) were non-supporting. Four lakes: Tygart, Laurel, Summersville, and Spruce Knob comprise the 1,775 acres of threatened waters. Tygart is threatened by acid mine drainage, Laurel is threatened by siltation from strip mining, and Summersville and Spruce Knob are both threatened by atmospheric deposition. Cheat Lake comprises the entire 1,730 acres of non-supporting waters. This lake is essentially sterile from acid mine drainage.

Only 91 lake acres were assessed for fish consumption use, as very few fish were collected for tissue analysis during this reporting cycle. All lake acres assessed for fish consumption use were fully supporting.

All 21,522 lake acres assessed during this reporting period fully supported the swimmable use. For the secondary contact recreation use, 21,475 acres (99.8 percent) were fully supporting while 48 acres (0.2 percent) were partially supporting. Lakes which partially supported the secondary contact recreation use had some type of physical impairment such as silt bars or aquatic macrophytes that impeded activities such as recreational boating.

Pollution cause categories for lakes classified as less than fully supporting are listed in Table III-15. Considering both major and moderate/minor impacts, siltation was found to have the greatest impact on lakes, followed by metals, organic enrichment/dissolved oxygen, and algal blooms. Other factors causing lake impairment were pH, nutrients, salinity/TDS/chlorides, oil and grease, and total toxics.

Pollution source categories for lakes classified as less than fully supporting are provided in Table III-16. Overall, coal mining affects more lake acres than any other activity, followed by silviculture, petroleum activities, and agriculture. Domestic sewage and industrial point sources (i.e, thermal pollution) also affect a sizable amount of lake acreage.

Water quality standards promulgated by the state Water Resources Board for streams also are applicable to lakes. 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.

Physico-chemical characteristics of lakes and tributaries monitored in 1993 are given in Appendix D-2, with violations of state water quality criteria (West Virginia State Water Resources Board, 1990) footnoted.

Most violations of state water quality criteria noted during this assessment were for iron and manganese. These metals tend to accumulate in reservoirs and are frequently found in high concentrations, particularly in the hypolimnion (i.e., bottom waters). Aluminum concentrations were also elevated in the hypolimnion of many lakes. However, the state does not have warmwater criteria for this metal. The coldwater aluminum standard of 0.5 mg/l was violated at both Edwards Run and Spruce Knob Lake. Both are stocked troutwaters. Edwards Run suffers from sedimentation while Spruce Knob is moderately

Table III-15

305(b) Relative Assessment of Causes

Sizes of waterbodies not fully supporting uses affected by various cause categories

Waterbody type: Lakes

(All size units in acres)

Cause categories	Major impact	Moderate/Minor impact
Cause unknown	0.00	0.00
Unknown toxicity	0.00	0.00
Pesticides	0.00	0.00
Priority organics	0.00	0.00
Nonpriority organics	0.00	0.00
Metals	6,372.10	3,283.50
Unionized Ammonia	0.00	0.00
Chlorine	0.00	3.50
Other inorganics	0.00	0.00
Nutrients	0.00	2,841.50
pH	1,791.00	1,200.00
Siltation	1,840.50	8,957.00
Organic enrichment/DO	3,628.00	74.50
Salinity/TDS/Chlorides	0.00	2,630.00
Thermal modifications	1,200.00	0.00
Flow alteration	0.00	0.00
Other habitat alterations	0.00	0.00
Pathogens	0.00	0.00
Radiation	0.00	0.00
Oil and grease	0.00	2,630.00
Taste and odor	0.00	0.00
Suspended solids	0.00	0.00
Noxious aquatic plants	57.00	0.00
Filling and draining	0.00	0.00
Total toxics	2,302.00	0.00
Turbidity	30.00	217.00
Exotic species	0.00	0.00
Discoloration	0.00	0.00
Sludge deposits	0.00	0.00
Odor	0.00	0.00
Fecal coliform	0.00	0.00
Algal blooms	968.00	2,630.00

Table III-16

305(b) Relative Assessment of Sources

Sizes of waterbodies not fully supporting uses affected by various source categories

Waterbody type: Lakes

(All size units in acres)

Source categories	Major impact	Moderate/Minor impact
Industrial point sources	1,200.00	0.00
Municipal point sources	0.00	33.50
Combined Sewer Overflow	0.00	0.00
Agriculture	39.50	3,278.50
Nonirrigated crop production	0.00	0.00
Irrigated crop production	0.00	0.00
Specialty crop production	0.00	0.00
Pasture land	0.00	0.00
Range land	0.00	0.00
Feedlots - all types	0.00	0.00
Aquaculture	0.00	0.00
Animal holding/management areas	0.00	0.00
Manure lagoons	0.00	0.00
Silviculture	2,617.00	1,636.50
Harvesting, restoration, residue management	0.00	0.00
Forest management	0.00	0.00
Road construction/maintenance	0.00	0.00
Construction	106.50	0.00
Highway/road/bridge	0.00	0.00
Land development	0.00	0.00
Urban runoff/storm sewers	12.00	0.00
Coal mining	4,887.00	1,598.00
Surface mining	0.00	0.00
Subsurface mining	0.00	0.00
Placer mining	0.00	0.00
Dredge mining	0.00	0.00
Petroleum activities	1,166.50	2,447.00
Mill tailings	0.00	0.00
Mine tailings	0.00	0.00
Land disposal	0.00	0.00
Sludge	0.00	0.00
Wastewater	0.00	0.00
Landfills	0.00	0.00
Industrial land treatment	0.00	0.00
Onsite wastewater systems (septic tanks)	0.00	0.00

Table III-16 continued

305(b) Relative Assessment of Sources

Sizes of waterbodies not fully supporting uses affected by various source categories

Waterbody type: Lakes

(All size units in acres)

Source categories	Major impact	Moderate/Minor impact
Hazardous waste	0.00	0.00
Septage disposal	0.00	0.00
Hydromodification	0.00	0.00
Channelization	0.00	0.00
Dredging	0.00	0.00
Dam construction	0.00	0.00
Flow regulation/modification	0.00	0.00
Bridge construction	0.00	0.00
Removal of riparian vegetation	0.00	0.00
Streambank modification/ destabilization	48.00	0.00
Drainage/filling of wetlands	0.00	0.00
Other	0.00	0.00
Domestic sewage	0.00	2,772.00
Atmospheric deposition	43.00	18.00
Waste storage/storage tank leaks	0.00	0.00
Highway maintenance and runoff	0.00	48.00
Spills	0.00	0.00
In-place contaminants	0.00	0.00
Natural	61.00	0.00
Recreational activities	0.00	0.00
Upstream impoundment	0.00	0.00
Salt storage sites	0.00	0.00
Source unknown	575.10	0.00
Beaver activity	0.00	0.00

acidic. 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.

PH was found to violate water quality criteria in several lakes impacted by either natural acidity or acid mine drainage. The lowest recorded in-lake pH was 5.1 in Cheat Reservoir, which is impaired by acid mine drainage from the inflowing Cheat River. The lowest recorded inflow pH (3.6) was measured in Laurel Run, a relatively minor tributary of Mt. Storm Lake.

Many of the lakes sampled during this assessment experienced hypolimnetic oxygen depletion in the summertime, with a few also experiencing low D.O. in the spring. The lakes containing low hypolimnetic D.O. in the spring were ones located in warmer climate zones, where they experienced early stratification. 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 their unique physical nature. For the purpose of this assessment, lakes were not considered impacted by low dissolved oxygen unless: 1) a decrease of >10 mg/l D.O. occurred between the surface and six foot depth (indicating severe stratification) or 2) the concentration was less than 5.0 mg/l D.O. for any reading taken between the surface and four foot depth.

<u>Acid Effects on Lakes</u>

All public lakes in West Virginia have been assessed for high acidity. No information, however, is available on toxic substances mobilization as a result of high acidity.

Four lakes totalling 2,743 acres are considered to be affected by high acidity. Four additional lakes totalling 5,675 acres are threatened by acidity, but are not significantly impaired. The primary measure used to determine acidic condition is pH. Acid affected lakes are those that have been shown to routinely violate the state water quality standard for pH, which has a lower limit of 6.0 standard units.

Specific sources of lake acidity can be divided into three categories: acid mine drainage (AMD), acid precipitation, and natural acidity. AMD significantly affects Cheat Lake (1,730 acres) and is the sole reason for the lake's non-supporting status. Fifty-three percent of pH samples collected from Cheat Lake during this reporting period were below 6.0.

AMD also affects Bloomington Lake (952 acres), rendering it partially supporting. Summit and Boley lakes (61 acres) are impacted by both acid precipitation and natural acidity. During this reporting period, 75% of pH samples collected from Boley Lake were below 6.0. Both Boley and Summit Lakes are partially supporting.

Tygart, Mount Storm, Summersville, and Spruce Knob lakes are threatened by high acidity, but are not considered significantly impaired. Tygart and Mount Storm lakes (2,950 acres) are threatened by watershed AMD while Summersville and Spruce Knob lakes (2,725 acres) are threatened by acid precipitation and natural acidity.

Many methods are being employed to mitigate the harmful effects of high acidity. In the Cheat, Tygart, Mount Storm, and Bloomington lake watersheds, AMD effects are being reduced through reclamation of abandoned and inactive coal mines. Also, at Mount Storm lake, a permit variance granted to West Virginia Power Company allows it to discharge highly alkaline water (pH 10-11) into the lake for the purpose of neutralizing the acidity. This has led to the establishment of a viable fishery.

Generally speaking, state lakes affected by acid precipitation also lie in areas where soils are naturally low in alkalinity. Such soils have little or no capacity to buffer acidic runoff. Summit and Boley lakes must be routinely limed in order to neutralize acidity so that trout can be stocked. Summit Lake is treated annually and Boley Lake about every three years. The watershed of Spruce Knob Lake is limed once every eight years in order to buffer runoff from the alkaline poor soils. This stabilizes lake pH enough to permit trout stocking. Although the lakes mentioned above are naturally acidic and infertile, atmospheric deposition tends to exacerbate the problem.

Currently, no methods are being employed specifically to remove toxic metals or other toxic substances mobilized by high acidity. However, liming to increase pH also has the ancillary benefit of decreasing the toxic effects of many heavy metals.

Toxic Effects on Lakes

Currently, no publicly-owned lakes are included in the state 304(l) list, which are waters not meeting state standards due to 307(A) toxics. The magnitude of state lakes affected by toxics is summarized in Table III-5.

During this reporting cycle, the only lakes monitored for toxics were the 10 U.S. Army Corps of Engineers' impoundments and two of the state's priority lakes...Summit and Mountwood Park. Of the 14,186 lake acres monitored for toxics, 7,810 (52 percent) were considered to have elevated levels (i.e., levels exceeding state water quality criteria). The affected lakes were Bloomington, Beech Fork, Burnsville and R.D. Bailey (all Corps of Engineers' impoundments). Bloomington contained high levels of the priority metals cadmium, lead, and zinc. Beech Fork, Burnsville, and R.D. Bailey all had high concentrations of zinc. The highest concentrations of these metals occurred in samples collected from the hypolimnion (bottom waters). As previously mentioned, accumulation of heavy metals in the bottom waters of large reservoirs is a rather common phenomenon because reservoirs typically act as sinks for watershed runoff pollution.

The source of toxic pollutants in the four lakes with elevated levels of toxics has not been determined with certainty. However, it is thought to be related to mine drainage.

The overall effect of toxics on West Virginia lakes is not well documented. Additional sampling must be conducted to obtain a better understanding of toxic impacts.

<u>Trends in Lake Water Quality</u>

Due to a lack of historical water quality data for most publicly-owned lakes in West Virginia, very little can be accomplished in the way of trend analysis. Only Cheat, Mount Storm, and nine of the 10 U.S. Army Corps of Engineers' reservoirs have sufficient data available for an accurate trend assessment.

Of the 11 lakes with sufficient data for trend analysis, seven can be categorized as having stable water quality while the remaining four are improved. None of the lakes show a trend toward degradation. All of the lakes classified as improved have recovered to some degree from the effects of acid mine drainage.

For this assessment, trends were determined primarily by statistical analysis of water quality parameters; however, change in designated use support status also was taken into account. An approximate time frame of 10 years was chosen to substantiate trend analysis.

With the initiation of the state Clean Lakes Program, it is anticipated that a solid base of water quality data can be established and updated, thus enabling a more comprehensive assessment of trends in the future.

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Chapter Four: Estuary and Coastal Information

Not applicable to West Virginia.

Chapter Five: Wetlands Information

Background

The West Virginia Wetlands Conservation Plan (WVWCP) was developed by the Department of Natural Resources' Division of Wildlife Resources in November, 1987. Much of the information provided in this chapter has been taken from that document. The WVWCP may be found in Appendix B.

Historical data on the state's wetlands is scarce and incomplete. Some historical information is discussed in the following narrative regarding trends. The National Wetlands Inventory (NWI) indicates the presence of about 102,000 acres (excluding reservoirs) of wetlands in West Virginia. This total acreage is comprised of 42,000 acres of palustrine forested wetlands; 24,000 acres of palustrine scrub-shrub wetlands; 20,000 acres of palustrine emergent wetlands; and 16,000 acres of ponds. With the addition of reservoir acreage, estimates reveal that less than 1 percent of the state's land and water area is wetland.

From 1957 through 1980, the state gained 10,900 acres in forested and shrub wetlands, and 11,400 acres in ponds. A loss of 5,800 acres of emergent wetlands also was experienced during this 23-year period. An overall analysis of these trends indicates net gains in both vegetated (51,000 acres) and non-vegetated (11,400 acres) wetlands.

Ironically, the greatest threat to protection of wetland resources in West Virginia has come with the proposed federal guidelines for wetland identification and delineation published in the August 14, 1991, issue of the Federal Register. The proposed guidelines place the wetland burden of proof on the resource agencies. For classification as wetlands, evidence of inundation for 15 days and saturation for 21 days (annually, during growing season) must be provided. The evidence must include 5 years of high resolution aerial photography or 3 years of groundwater monitoring during years of normal precipitation in addition to physical evidence at the time of the field determination.

West Virginia's wetland areas that may be most significantly affected are transitional zones between inundated wetlands and upland ecosystems and wetlands dominated by vegetation categorized as facultative upland species (e.g., red spruce). The Office of Water Resources provided in-depth comments in regard to the proposed guidelines and estimated that without substantial revision to the proposal, the state may lose about 50 percent of its transitional wetlands.

The federal Delineation Manual is important in protection of the state's wetlands as it is the method used by the U.S. Army Corps of Engineers (COE) to determine wetland areas that may be impacted by a permit application pursuant to Section 404 of the Clean Water Act. The Division's primary wetland protection avenue is through the Section 401 Certification Program for such federal licenses and permits. As the COE has primacy for administration of Section 404, the Division does not have the authority to identify and delineate wetlands for federal permits purposes.

Extent of Wetland Resources

Table III-17 denotes the extent of wetland resources in West Virginia. The figures used in this table are the same as those in the 1990 305(b) report, as not enough data was collected this reporting period to provide an accurate update. With the aid of wetlands grant funding, the state will be able to assess its wetland resources more thoroughly in the future.

Integrity of Wetland Resources

West Virginia does not have uses designated for wetlands. Therefore, use attainment information is not applicable.

Table III-17

Extent of Wetlands, by Type

Wetland Type	Historical Extent acres (1)	1990 305(b) Acreage (2)	Most Recent Acreage (3)	Percent of Change (2 to 3)
Palustrine Forested	36,600	42,000	42,000	*
Palustrine Scrub-Shrub	18,500	24,000	24,000	*
Palustrine Emergent	25,800	20,000	20,000	*
Ponds	4,600	16,000	16,000	*

Source of Information: National Wetlands Inventory (USFWS, 1974).

* Wetlands have not been inventoried thoroughly enough to determine percent change from 1990 to present.

Futhermore, the state does not have a formal wetland monitoring program.

<u>Development of Wetland Water Quality Standards</u>

A summary of the development status of wetland water quality standards is provided in Table III-18.

The primary focus of West Virginia's wetland management program is on acquisition and protection through regulation. State water quality standards define wetlands to "include such areas as swamps, marshes, bogs, and other land subject to frequent saturation or inundation, and which normally support a prevalence of vegetation typically found where wet soil conditions prevail." Under state law (Chapter 20, Section 5A-2. Definitions), wetlands are included as waters of the state. However, state water quality standards do not separately classify wetlands as a water use category.

West Virginia does not have any type of wetland protection legislation, nor has the anti-degradation policy been used for wetland protection. The latter, however, is applicable to wetlands. Permitting authority of 404 activities in West Virginia is maintained by the U.S. Army Corps of Engineers. At this time, the state is not considering assumption of the 404 program. The state does have regulations for 401 certification under the Code of State Regulations, Title 47 Series. These regulations are used for the protection of wetland resources.

The West Virginia Division of Natural Resources received a grant in May, 1990 to initiate and aid in the development of wetland water quality standards. West Virginia has started to submit proposed revisions to Title 46, Regulations Governing Water Quality Standards. The proposals include a revision of 3.2.i of the conditions not allowable in state waters, which as amended states:

Table III-18

Development Status of State Wetland Water Quality Standards

	In Place	Under Development	Proposed
Use Classification			X
Narrative Biocriteria		X	
Numeric Biocriteria		X	
Anti-degradation	X		
Implementation Method		X	

> Any other condition, including radiological exposure, which adversely alters the integrity of the waters of the state including wetlands; no significant adverse impact to the chemical, physical, hydrologic, or biological components of aquatic ecosystems shall be allowed.

A proposed amendment to the water use categories will specifically include wetlands in Category B - Propagation and Maintenance of Fish and Other Aquatic Life. The amendment states:

> 6.3.d Category B4 - Wetlands - as defined in Section 2.17; stream criteria may not be appropriate for application to wetlands.

Category D (Agriculture and Wildlife Uses) is proposed for revision to include wetlands, in addition to all stream segments, as areas used by wildlife.

The anti-degradation policy has not been revised to specifically address wetlands; However, as wetlands are classified as waters of the state, they are protected by the policy. West Virginia used the anti-degradation policy for wetland protection on two specific occasions in 1991. In the review of a Section 404 permit application, the Division of Natural Resources denied issuance of Section 401 Certification due in part to wetlands associated with a native trout stream and therefore considered as National Resource Waters in accordance with the water quality standards. In a separate case, the Division advised the National Forest Unit that wetlands in the National Forest were classified as National Resource Waters and were protected by the anti-degradation policy to the fullest extent possible (i.e., non-degradation).

<u>Additional Wetland Protection Activities</u>

As stated at the beginning of this chapter, West Virginia has developed a conservation plan for the protection of wetland resources (WVWCP, Appendix B). This plan was prepared in response to the Emergency Wetlands Resources Act of 1986 (P.L. 99-645) and focuses on various means of wetland acquisition, securing additional funding for acquisition, enforcement of and participation in Sections 404 and 401 of the regulatory process, and the establishment of effective state laws and regulations to control the degradation and destruction of riparian wetlands.

Additional goals for fulfillment of the wetland grant mentioned in the previous section include:

a) Acquiring base information on specific wetland communities in West Virginia (i.e., vegetation, flora, fauna, and functions and values) in order to assess critical and/or unique characteristics not presently documented.

b) Implementing wetland evaluation techniques.

c) Initiating development of a use-based wetland classification system.

d) Developing a mitigation policy for wetland impacts.

e) Assisting state wetland watch groups.

f) Developing informational brochures emphasizing the importance of wetlands and wetland protection efforts.

Efforts to incorporate wetland protection into other water management programs have not been extensive. Monitoring efforts on open channel (streams/rivers) wetlands have been conducted in conjunction with the 401 certification program. These efforts have resulted in the identification of wetland habitat for freshwater mussels (including endangered species) and fish spawning areas. Other programs such as Clean Lakes and Groundwater are relatively new activities for West Virginia and have not evolved enough to incorporate wetland protection. The state's nonpoint source management plan does identify all types of wetlands as areas for protection. However, this program has only recently expanded to actively pursue this intent. There is no requirement nor support by the state for wetland resource inventories by local jurisdictions.

The DEP's Office of Water Resources administers the state's wetland protection activities through the 401 certification program. This program is coordinated through DNR's Wildlife Resources Section. The state Division of Forestry advises loggers to avoid streams and wet areas on silviculture operations, while relying upon the support of Office of Water Resources for enforcement of water quality violations resulting from these operations.

LITERATURE CITED

United States Fish and Wildlife Service, 1974. National Wetlands Inventory. St. Petersburg, FL.

PART IV: GROUND WATER QUALITY

BACKGROUND

"Ground water in West Virginia is, on the average, both abundant and of adequate quality" (WVDNR, 1988). The opening statement remains true largely due to the rural nature of West Virginia.

The Groundwater Protection Act (GWPA), passed in June 1991, provides West Virginia with a framework to manage the state's ground water resources. The GWPA states "... that it is the public policy of the state of West Virginia to maintain and protect the state's ground water so as to support the present and future beneficial uses and further to maintain and protect ground water at existing quality where the existing quality is better than that required to maintain and protect the present and future beneficial uses." (WV GWPA 1991)

Ground water is an important resource that is used throughout West Virginia for public, domestic, and industrial supply. The water supply for about 40-45 percent of the State's population is derived from ground water sources - wells, springs, coal mines, and limestone mines. Although most of the urban areas in the State obtain water for public supply from surface water sources, 90 percent of the rural population depends on ground water for domestic use. More than one-half of all ground water used for public supply requires treatment to meet drinking water standards established by the US EPA. Ground water usage for drinking water has decreased somewhat over the last several years due to an increase in public water supply systems. Many of these larger systems rely more on surface waters as their water source.

"Increased water use and contamination of the ground water resources in West Virginia have made evaluation of the quality of ground water necessary. Planning, management, and regulatory agencies need reliable hydrologic information to effectively manage and protect the State's water resources. Long-term records of ground water quality are needed to provide a uniform database that can be used to evaluate the effects of development and change in water use, and to aid in the prediction of changes in the quality and quantity of ground water. Because of past and present contamination of ground water, baseline water quality data are needed as a background with which to assess the extent of contamination." (Ground Water Quality Monitoring Program for West Virginia, USGS, March 1992)

WEST VIRGINIA AQUIFER GROUPS

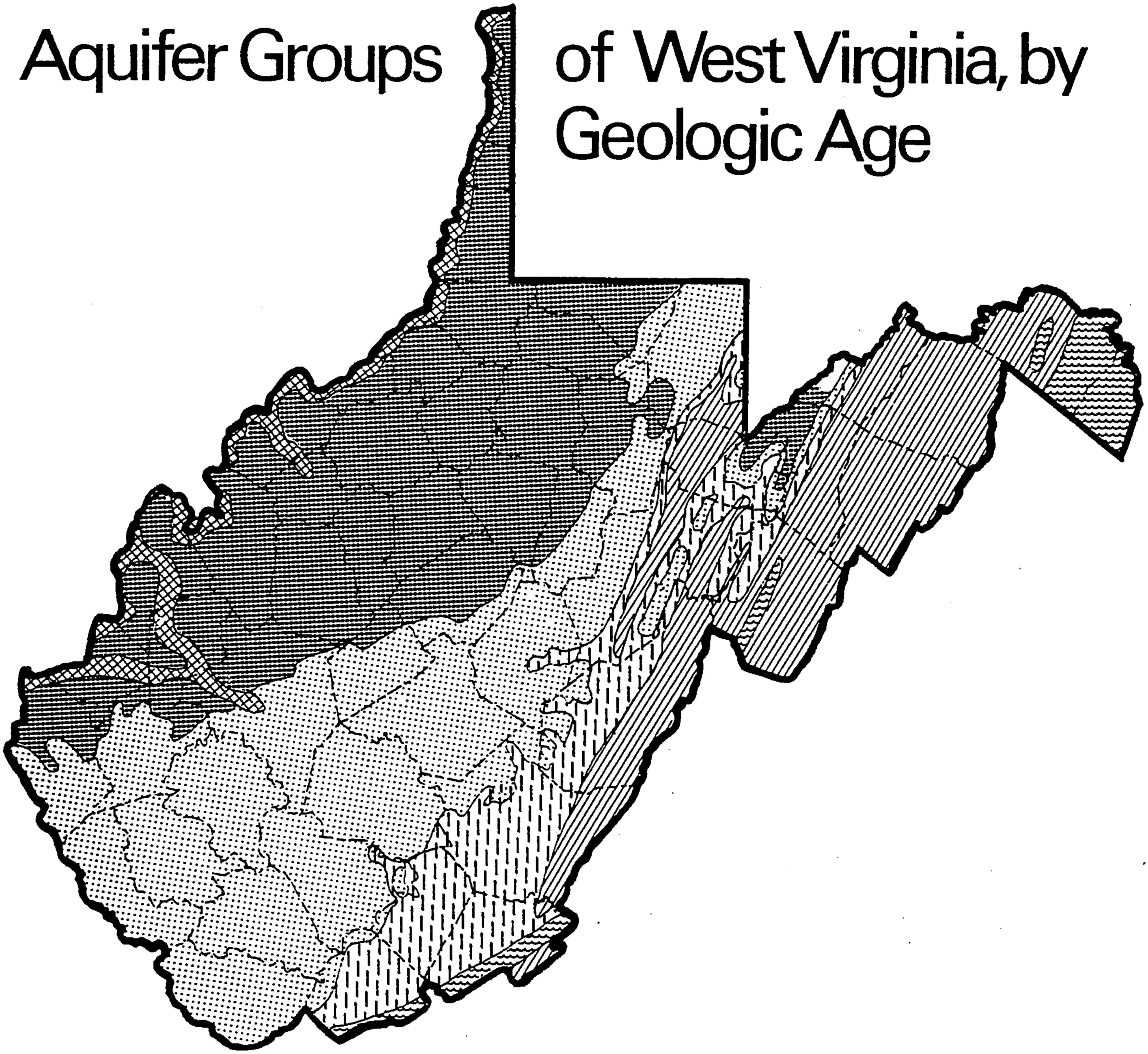
"There are two major types of aquifers in West Virginia, unconsolidated alluvial deposits and sedimentary bedrock. Major alluvial deposits are located along the Ohio and Kanawha Rivers and in the Teays Valley. Approximately 55 percent of all ground water used for public supply are from alluvial deposits along the Ohio River. The bedrock aquifer system is typically composed of alternating layers of sedimentary rock such as sandstone, siltstone, shale, limestone, and coal. Movement of water in these rocks primarily is through fractures, bedding-plain separations, and, in limestone areas, solution openings." (Ferrell, 1987) (Figure IV-1).

LEGISLATION

The Division of Environmental Protection was designated as the lead agency for ground water protection and is charged with maintaining the state's ground water management strategy, developing a central ground water data management system, providing a biennial report to the legislature on the status of the state's ground water and ground water management programs, and developing rules regarding the monitoring and analysis of ground water.

Figure IV-1

Aquifer Groups of West Virginia, by Geologic Age



	Alluvial aquifers - Sand and gravel, interbedded with silt and clay. Used as source for public and industrial supplies along the Ohio and Kanawha rivers.
	SEDIMENTARY BEDROCK AQUIFERS
	Upper Pennsylvanian - Predominantly shale, with sandstone, siltstone, coal and limestone. Used mainly for domestic and farm supplies.
	Lower Pennsylvanian - Predominantly sandstone, with shale, coal and limestone. Used mainly for domestic and farm supplies.
	Mississippian - Predominantly sandstone and limestone with shale. Adequate yields for domestic and farm supplies. Springs in limestone units tend to yield larger amounts of water, often producing adequate yields for larger commercial and industrial supplies.
	Devonian and Silurian - Shale, siltstone, limestone and sandstone. Adequate yields for domestic, farm, and small to moderate industrial and public supplies.
	Ordovician and Cambrian - Sandstone, shale and limestone. Adequate yields for domestic, farm, and moderate to large industrial and public supplies.

The Groundwater Protection Act also gave the state Water Resources Board the exclusive authority to set statewide ground water standards. The standards can be no less stringent than EPA's safe drinking water standards. However, the standards can be more stringent if the state sees fit. If background quality is better than the standard, the background quality will be the standard and cannot be altered unless a variance is granted. In essence West Virginia has adopted an anti-degradation policy that allows for variances for specific activities. Regulatory agencies agreed that the Water Resources Board should adopt EPA Primary Drinking Water Standards as a minimum for the WV GWPA Standards. The Water Resources Board agreed with this and adopted as a minimum the Federal Safe Drinking Water Standards as promulgated in April 1992 with the exception of Lead. The Ground Water Program felt that since a majority of its state's residents derive their drinking water from ground water supplies, that a need existed for a standard to protect the ground water resource long before the contaminant reached the tap. A minimum standard of 0.015 ppm was adopted for ground water quality. On August 7, 1992, a public hearing was held concerning the Groundwater Quality Standards (GWQS). Considerable amount of verbal comment was directed towards reducing the dioxin standard from the proposed MCL of 30 ppq to a non-detect limit. The final dioxin standard established was a value of 5 ppq. Table IV-1 contains the Groundwater Quality Standards which were put into effect August 23, 1993.

The status of other ground water legislation promulgated as of June 30, 1993 follows (Information taken from the Ground Water Biennial Report to the Legislature, 1994):

TABLE IV-1: GROUNDWATER QUALITY STANDARDS

APPENDIX A of the WV Legislative Rule
Title 46, Series 12
Requirements Governing Ground Water Standards

Constituent	Not To Exceed (in mg/l, except where noted)
Alachlor	0.002
Antimony	0.006
Asbestos (fibers/l less than 10 ug/l)	7 MFL*
Atrazine	0.003
Barium	2.0
Benzene	0.005
Benzo (a) pyrene (PAH)	0.0002
Beryllium	0.004
Cadmium	0.005
Carbofuran	0.04
Carbon Tetrachloride	0.005
Chlordane	0.002
Chromium (total)	0.1
Cyanide	0.2
2,4-D	0.07
Dalapon	0.2
Di-2-ethylhexyl|adipate	0.4
Di-2-ethylhexy|phthalate	0.006
Dibromochloropropane (DBCP)	0.0002
Dichlorobenzene p-	0.075
Dichlorobenzene o-	0.6
Dichlorobenzene m-	0.6
Dichloroethane (1,2)	0.005
Dichloroethylene (1,1-)	0.007
Dichloroethylene (cis-1,2-)	0.07
Dichloroethylene (trans-1,2-)	0.1
Dichloromethane	0.005
Dichloropropane (1,2-)	0.005
Dinoseb	0.007
Diquat	0.02
Endothall	0.1
Endrin	0.002
Ethylbenzene	0.7
Ethylene dibromide (EDB)	0.00005
Fluoride	4.0
Heptachlor	0.0004
Heptachlor epoxide	0.0002
Hexachlorobenzene	0.001
Hexachlorocyclopentadiene	0.05

TABLE IV-1: GROUNDWATER QUALITY STANDARDS (cont'd)

Constituent	Not To Exceed (in mg/l, except where noted)
Lead	0.015
Lindane	0.0002
Mercury (inorganic)	0.002
Methoxychlor	0.04
Monochlorobenzene	0.1
Nickel	0.1
Nitrate (as N)	10.0
Nitrite (as N)	1.0
Total Nitrate and Nitrite (both as N)	10.0
Oxamyl (Vydate)	0.2
Pentachlorophenol	0.001
Picloram	0.5
Polychlorinated biphenyls	0.0005
Selenium	0.05
Simazine	0.004
Styrene	0.1
2,3,7,8-TCDD (Dioxin)	0.000000005
Tetrachlorethylene	0.005
Thallium	0.002
Toluene	1.0
Toxaphene	0.003
2,4,5-TP (Silvex)	0.05
Trichlorobenzene (1,2,4-)	0.07
Trichloroethane (1,1,1-)	0.2
Trichloroethane (1,1,2-)	0.005
Trichloroethylene	0.005
Vinyl Chloride	0.002
Xylenes (total)	10.0
Radionuclides	
Beta particle and photon activity	4 mrem**
Gross alpha particle activity	15 pCi/L***

*MFL = million fibers per liter.
** mrem = millirem (rem = roentgen-equivalent-man).
*** pCi = picocurie.

Title 47 Series 55 - Groundwater Protection Act Fee Schedule:

Re-authorizes a schedule of fees for the ground water protection fund. The rule is applicable to any person who owns or operates facilities or conducts activities subject to the provisions of the GWPA. The fees are based on the potential to pollute ground water. The fee formula is based on pollutant quantity and quality and reflects the cost that the division and other agencies would incur in providing certification, compliance and enforcement services imposed by statute.

This rule was in effect on August 25, 1991. This rule had a sunset clause in it giving the rule a July 1, 1994 expiration date. With a few minor changes, the rule was refiled in August 1993 for review in the 1994 Legislature.

Title 47 Series 56 - Assessment of Civil Administrative Penalties:

Sets forth criteria and procedures to be used in assessing administrative penalties for ground water quality violations. These penalties may be used instead of civil or criminal action to address violations of the GWPA. However, they do not inhibit or prohibit due process because the violator retains the option of appealing the penalty order.

This rule went through the pre-rulemaking process and was submitted to the 1994 Legislature.

Title 47 Series 57 - Groundwater Quality Standard Variance:

Establishes criteria for variances and deviations from the requirements of the GWPA that would otherwise obligate sources to assure compliance with existing quality, ground water quality standards of the state Water Resources Board and preventative action limits imposed by ground water regulatory agencies.

This rule went through the pre-rulemaking process and was submitted to the 1994 Legislature.

Title 47 Series 58 - Groundwater Protection Regulations:

Establishes a series of practices that must be followed by any person who owns or operates facilities, or conducts activities subject to the provisions of the GWPA. The practices are designed to prevent ground water contamination from facilities and activities that are subject to regulatory requirements by the DEP's Office of Waste Management and Office of Water Resources.

This rule went through the prerule-making process and was submitted to the 1994 Legislature.

Title 47 Series 59 Groundwater Monitoring Well Driller Certification Program

The rule was established for the certification of monitoring drillers and monitoring well installations, alterations, and abandonment.

The Ground water Monitoring Well Driller Certification Program has gone through the rule-making process, been modified and moved on for Legislative approval.

Passage of the Ground water Protection Act is expected to have a positive impact on ground water in West Virginia. The law provides regulatory agencies with the funding and guidance to obtain, maintain, and analyze the data necessary to provide an objective, quantitative, and spatial representation of the actual condition of the state's ground water.

Weaknesses in current regulations should be strengthened, consistency in program regulation/enforcement should be achieved, and cooperation among agencies is now mandated. If the concepts outlined in the Ground water Protection Act all come to fulfillment, West Virginia's ground water should indeed become a well managed and closely monitored resource.

GROUND WATER QUALITY

West Virginia's mountains contain abundant natural resources. West Virginia is one of the nations leading producers of fossil fuels (coal, oil, and natural gas). The state also has numerous chemical plants, industrial facilities, limestone and gravel quarries, and commercial farm operations. Today most activities that threaten ground water quality are regulated in some manner. West Virginia has 43,000 known active oil and gas wells, 14,000 plugged oil and gas wells, and 49,000 known "orphaned" oil and gas wells. According to the Mining and Reclamation Office, there are 3406 active mining permits with 2183 being coal mines and other active resource mines. The other 1,223 permits are associated with hauling roads, processing, etc. There are also 969 permitted facilities (including stormwater permits, NPDES, and landfill discharges) with industrial discharges, and approximately 250 municipal plant and 1,200 package plant dischargers of municipal wastewater. On an annual basis, the state registers 6500 pesticides; deposits two million tons of solid waste; generates 40,000 tons of hazardous waste; and issues permits for 7500 septic tank installations/ modifications. In addition, the state manages 645 class II and III injection wells, more than 1400 Class V injection wells, and over 21,000 underground storage tanks. Tables IV-2 and IV-3 represent major sources of ground water and potential ground water contaminants.

Monitoring well data from many of these facilities activities is collected as part of the permitting/regulatory process, but is not readily available for analysis because the data is not in computerized form. Therefore, the information in Tables IV-2 and IV-3 is largely subjective, based on conversations with numerous regulatory personnel. A database initiative is being worked on at this time (June 1995) and hopefully by the 95/97 305(b) report, a better assessment can be achieved.

From a survey/questionnaire handed out to approximately 30 enforcement personnel (primarily waste/water inspectors), the following facilities are those areas that are perceived by the inspectors as posing the greatest risk for ground water contamination and should get the greatest attention (not including the 5 priorities mentioned in Table IV-2):

1) Petroleum bulk plants, terminals and gas stations
2) Salvage/Junk yards and recycling centers
3) Natural gas compressor stations

Table IV-2

Major Sources of Ground Water Contamination

Source	Incidents Reported (X = Yes)	Relative Priority (1=highest)
Animal Feedlots	N/A	
Containers		
Injection Wells (all incl. Class V)	X	
De-icing Salt Storage Piles	X	
Fertilizer Applications		
Irrigation pract. (return flow)		
Land Application/treatment	X	
Landfills - Municipal	X	2
Landfills - On-site Industrial (excluding pits, lagoons, surface impoundments)	X	5
Other landfills	X	
Material Transfer Operations		
Material Stockpiles		
Mining and Mine Drainage	X	1
Pesticide Applications		
Pipelines and Sewer Lines		
Radioactive Disposal Sites		
Salt-water Intrusion	X	
Septic Tanks (Systems)	X	
Shallow Injection Wells		
Storage Tanks (above ground)	X	
Storage Tanks (below ground)	X	
Storm Water Drainage Wells		
Surface Impoundments (excluding oil and gas brine pits)	X	3

Table IV-2 Continued...

Major Sources of Ground Water Contamination

Source	Incidents Reported (X = Yes)	Relative Priority (1=highest)
Oil and Gas brine pits	X	
Transportation of Materials		
Urban Runoff		
Waste Tailings		
Waste Piles		
Other:		
Abandoned Hazardous Waste Sites	X	4
Regulated Hazardous Waste Sites	X	
Agriculture Activities	X	
Road Salting	X	
Abandoned Wells	X	

Table IV-3

Potential Ground Water Contaminants
(X = documented or suspected)

ORGANIC CONTAMINANTS	
Pesticides	X
Other agricultural chemicals	
Petroleum compounds	X
Other Organic chemicals:	
Volatile	X
Semi-Volatile	X
Miscellaneous (Synthetic)	X
MICROBIAL CONTAMINANTS	
Bacteria	X
Protozoa	
Viruses	
INORGANIC CONTAMINANTS	
Pesticides	
Other agr. chemicals	
Nitrates	X
Fluorides	
Brine/Salinity	X
Metals	
Arsenic	X
Other Metals	X
Radionuclides	
Other	

AMBIENT GROUND WATER MONITORING NETWORK (AGWMN)

The Groundwater Protection Act mandates in Section 6(c)(4) that "the Division of Environmental Protection, Bureau of Public Health, and Department of Agriculture are hereby authorized:

> To conduct ground water sampling, data collection, analysis and evaluation with sufficient frequency so as to ascertain the characteristics and quality of ground water, and the sufficiency of the ground water protection programs established pursuant to this article." (WV GWPA, 1991)

An ambient ground water monitoring was thus established. The purpose and goal of the ambient monitoring network is to characterize the background quality of WV's major aquifers. With the network data, we will establish a ground water quality baseline for the state. This data can then be used for comparison when ground water quality issues such as contamination and clean up arise.

The Ambient Ground Water Monitoring Network (AGWMN) was created through cooperative efforts. The Office of Water Resources received assistance from U.S. Geologic Survey (USGS) to develop the monitoring program. Sites were chosen and a sampling strategy was developed. There were some constraints set by the Office of Water Resources (OWR) in determining location of sites. The criteria used to pick sites for inclusion into the network were:

1. Aerial coverage of the state
2. Coverage of WV's major aquifers- Carbonate, Non-Carbonate bedrock, and river valley alluvial aquifers
3. Selection of various land usage- agriculture, industrial, mining, forest, urban, commercial, and rural areas

4. Since funding was not available to drill new monitoring wells, existing wells with pumps and springs were used.
5. Long term, year-round accessibility and availability

In early 1993 twenty-six (26) sites spanning the state had been established to begin the AGWMN. These sites cover 25 counties and various aquifers. The idea was to sample these sites every quarter for three (3) years, then twice a year for two (2) years, and then annually. As the frequency of these initial sites decreases, new site locations will be established to meet all criteria and restrictions. These 26 sites were made up of state parks and forests (10), federal fish hatcheries (4), public supply wells (9), and existing springs (3).

Parameters that are monitored in the network are volatile and semi-volatile organics, and inorganics such as metals and nutrients. Water temperature, air temperature, barometric pressure, pH, conductivity and dissolved oxygen are all measured in the field. The pH, Conductivity and Dissolved Oxygen parameters are measured using a Corning Deluxe Field System water testing meter. At some time in the near future, fecal coliform and fecal streptococcus bacteria will also be analyzed in the field.

Table IV-4 lists the site names, their (STORET) station ID name, and the county location. These sites were monitored once in the first half of 1993, and the results of the sampling events are found in Appendix E-1.

DATA MANAGEMENT:

In Section 6(a)(2) of the Groundwater Protection Act it states that the lead agency (Office of Water Resources) is "to develop, as soon as practical, a central ground water data management system for the purpose of providing information needed to manage the state's ground water program" (WV GWPA, 1991).

The Act {22-12-2(c)(2)(vi)} also states that the ground water management program is to "provide for the mapping and analysis of the state's ground water resources and coordination of the agencies involved."

At this time, there is no centralized database. A centralized database will serve to store all ground water data from all agencies and programs. Data from investigations, compliance monitoring, ambient sampling, etc. will be included in this database. This database will also be linked to the Geographic Information System, or GIS, which will fulfill our "mapping" obligations. Data from the ambient network is readily available in LOTUS spreadsheets. There is also a LOTUS file set up to transfer data from the LOTUS format into STORET (Courtesy of Florida's Environmental Quality Agency).

OFFICE OF WASTE MANAGEMENT INFORMATION

The following information was gathered from DEP's Office of Waste Management. It is a summary of facts, with no interpretation or discussion. Once a database has been established and data can be better quantified and qualified, an interpretation will be made.

WV Treatment Storage Disposal Facilities (TSD)
With Land Disposal Units

Closed - Closed	(CC)	46
Active - Permitted	(AP)	8
Active - Unpermitted	(AU)	3
Inactive - Closed	(IC)	1
Inactive - Permitted	(IP)	2
Inactive - Unpermitted	(IU)	1

TABLE IV-4: AMBIENT GROUND WATER MONITORING SITES WITH STORET ID NAMES

SITE NAME	COUNTY	STATION ID
Lefevre Spring	Berkeley	GWAMBNET003-01
Follansbee Well	Brooke	GWAMBNET009-01
Fayetteville Well	Fayette	GWAMBNET019-01
Davis Spring	Greenbrier	GWAMBNET003-01
White Sulphur Springs	Greenbrier	GWAMBNET025-01
Oakland PSD	Hancock	GWAMBNET003-01
Lost River State Park	Hardy	GWAMBNET003-01
Waters Smith State Park	Harrison	GWAMBNET003-01
Harpers Ferry Spring	Jefferson	GWAMBNET003-01
Kanawha State Forest	Kanawha	GWAMBNET003-01
Chief Logan State Park	Logan	GWAMBNET003-01
Welch Water Well	McDowell	GWAMBNET003-01
Point Pleasant Well#4	Mason	GWAMBNET003-01
Chestnut Ridge Park	Monongalia	GWAMBNET003-01
Berkeley Springs	Morgan	GWAMBNET003-01
Edray Fish Hatchery	Pocahontas	GWAMBNET003-01
Cannery Lane Well	Putnam	GWAMBNET003-01
Bowden Fish Hatchery	Randolph	GWAMBNET003-01
Wallback PHA Well	Roane	GWAMBNET003-01
Pipestem State Park	Summers	GWAMBNET003-01
Sand Spring, Canaan Valley	Tucker	GWAMBNET003-01
Cabwaylingo State Forest	Wayne	GWAMBNET003-01
Holly River State Park	Webster	GWAMBNET003-01
New Mantinsville	Wetzel	GWAMBNET003-01
Palestine Fish Hatchery	Wirt	GWAMBNET003-01
Parkersburg Well	Wood	GWAMBNET003-01

#of units/county		ACTIVE	FACILITIES
Hancock -	4	2	3
Pleasants -	6	2	2
Braxton -	2		1
Putnam -	7		3
Brooke -	4		3
Hampshire -	2		1
Kanawha -	13	2	4
Monongalia -	1		1
Marshall -	10		4
Tyler -	8	2	1
Lewis -	1		1
Jackson -	3		1

S04-Surface Impoundment for storage - 27
T02-Surface Impoundment for treatment - 26
D80-Landfill - 4
D83-Surface Impoundment for disposal - 4

All closures prior to July 1, 1991 except:
Bayer, Inc., New Martinsville, Marshall Co., closed a Surface Impoundment for Storage in October 1991.

Hazardous Waste RCRA Remediation Activities

- 6 of 7 sites are active
- All use Pump and Treat as remediation technology
- Various contaminants, most are organic, some metals; benzene &/or chlorobenzene in 4 of the 6 active sites

Hazardous Waste RCRA Facilities Investigations (RFI) and Corrective measure studies (CMS)

- 13 Active sites
- Chemical Manufacturing Facilities - 12
- Safety Kleen Facility - 1
- 4 Facilities are pending investigation outcome
- Most Contaminants are organic, some metals;
- Trichloroethene (TCE), Tetrachloroethane (PCE) and benzene products are at several sites

# of Active Sites/County:

Wood	- 2	Kanawha	- 5
Marshall	- 2	Cabell	- 1
Berkeley	- 1	Lewis	- 1
Ohio	- 1		

Hazardous Waste RCRA Corrective Action Orders (3008h)
- 5 of 6 facilities are Active
- Mostly Chemical Facilities

# of Active Sites/County:

Monongalia	- 1	Berkeley	- 1	Marshall	- 1
Brooke	- 1	Kanawha	- 1	Hancock	- 1

Hazardous Waste RCRA Remediation Activities Under Administrative Order

- 4 Active Facilities
- 3 Facilities using Pump and Treat Remediation Technology
- 1 Facility recovering Free Product and Recycling
- 2 Metal Plating facilities - Chromium contamination
- 2 facilities with organic contamination

Solid Waste Landfills

There are 21 Facilities in operation with existing composite lining:
- 3 permitted and in operation prior to July 1991
- 9 operating under newly or reissue permit 1991/1993

There are 26 Landfills closed, 1 pending:
- 3 closed prior to July 1991
- 5 closed between July 1, 1991 and June 30, 1993

There are 18 Solid Waste Transfer Stations

There are 4 D-1 Landfills:
- Preston
- Kanawha
- Lewis
- Greenbrier

NOTE: D-1 landfills are Construction/Demolition Waste landfills and do not accept garbage waste.

Underground Storage Tanks and Leaking Underground Storage Tanks

- Total UST's - 21,652 as of 4/1995
- Total Sites - 7,491 as of 4/1995
- Leak Sites - 438 July 1, 1991 thru June 30, 1993

Known GW Impacted areas: 48 (July 1, 1991 thru June 30, 1993)

Berkeley	- 2	Grant	- 1	Greenbrier	- 3
Harrison	- 2	Jefferson	- 1	Kanawha	- 5
Lewis	- 3	Logan	- 1	Marion	- 1
McDowell	- 1	Mercer	- 9	Monroe	- 1
Nicholas	- 1	Ohio	- 2	Pendleton	- 1
Pocohontas	- 2	Preston	- 1	Raleigh	- 3
Upshur	- 1	Webster	- 1	Wirt	- 1
Wood	- 1	Wyoming	- 4		

National Priority List (NPL or Superfund List) Sites in West Virginia:

West Virginia Ordinance Works	- NPL	Mason Co.
Former Pantasote Plant	-	Mason Co.
Fike/Artel	- NPL	Kanawha/ Putnam Co.
Morgantown Ordinance Works	- NPL	Monongalia Co
Martinsburg Air National Guard	-	Berkeley Co.
Allegany Ballistics Laboratory	- NPL	Mineral Co.
Yeager Air National Guard	- IRP	Kanawha Co.
Leetown Pesticides Dump	- NPL	Jefferson Co.
Hanlin Chemical	- Proposed NPL	Marshall Co.
Fairmont Coke-Sharon Steel	- Proposed NPL	Marion Co.

IRP = Installation Restoration Program

HEALTH DEPARTMENT INFORMATION:

Following is a summary of the information on "Ground Water Indicators" in the 305(b) guidance document. For the most part, data collected by the Bureau of Health, Health Services Division, has been geared towards enforcement of the Safe Drinking Water Act requirements; therefore, ground water analysis has been for mostly "finished" or treated waters than for raw ground water. Much data for this time period is not in a readily available form.

The first ground water indicator requested calls for MCL excursions. (See Table IV-5) For the periods between 6/91 through 6/93, there were 45 MCL excursions in 33 community ground water systems. There was one excursion for Nitrates, one for Total Halo-Methanes (THM's), and 31 for Coliform bacteria. THM's are produced in the chlorination treatment of raw water, thus the excursion in the finished water is not indicative of raw ground water. The number of excursions for Coliform bacteria in finished water also is not very representative of the ground water, but rather indicates the quality of treatment and distribution. This however does indicate that there are some problems of high bacteria in some ground water systems.

There are 360 ground water supplies in West Virginia. The 33 community ground water supplies that had MCL excursions represents approximately 9% of the supplies. These 33 ground water systems supply water to 28,324 people which is about 9% of the 327,000 people that are supplied by ground water.

During this reporting period there were 271 raw ground water samples tested for VOC (Volatile Organic Compounds). These results showed three instances that Trichloroethene (TCE) and Tetrachloroethene (PCE) were detected above the MCL's. This represents only about 1% of the samples.

Data is not readily available for raw water bacteria during this reporting period. A study to determine whether ground water sources are under direct influence of surface water has been recently initiated. Some results of this study indicate that approximately 1/6 of the public ground water sources are contaminated with excessive bacteria. This may be due to poor well construction or poor well location in relation to septic systems and causes will be determined and addressed in the future.

There were no records of excursions of metals or pesticides during 91/93. Relatively few samples are taken of raw ground water and treatment will generally remove these contaminants from finished water which is sampled.

Ground Water Indicator 2 asks for the number of public ground water supplies with MCL excursions and the total populations that these serve. There are 360 ground water supplied systems serving 327,000 people. Of these, as mentioned before, 33 systems had MCL excursions. These 33 systems serve 28,324 people.

Ground Water Indicator 3 requests information on systems that had 50 to 100 percent of MCL's. This information is not available for this reporting period.

TABLE IV-5: Number of MCL Excursions for Ground Water-Based or Partial Ground Water Supplied Community PWS's for Selected Contaminants in Four Contaminant Groups

Contaminate Group	Contaminant	No. of MCL Excursions	No. of Samples
Metals		None	?
VOC's	Trichloroethene	3	271
	Tetrachloroethene	3	271
	Total Halo-Methanes	1	271
Pesticides		None	?
Nitrates		1	?
Bacteria		43	?

NOTE: This is for FINISHED/TREATED ground water, NOT RAW

Ground Water Indicator 4 asks about Local Wellhead Protection Programs in place. On December 17, 1992, EPA approved West Virginia's Wellhead Protection Program. Although the approval was not until late 1992, the Environmental Engineering Division began meeting in July 1991 with local wellhead protection committees to get the program started instead of waiting for approval. The first wellhead protection area was delineated and a contaminant survey was made for Williamstown. Williamstown's wellhead protection program was state approved on August 31, 1992. Since then 31 other delineated areas have performed and received approval for their contaminant surveys. The 32 wellhead protection programs currently in place serve 80,590 people.

During this reporting period, there were 135 local wellhead protection programs initiated, representing 299,027 citizens, or 83% of the community population served by ground water. Of the 135 programs initiated, 60 have wellhead protection areas already delineated while 75 still require delineation. Summary information for the 60 delineated wellhead protection areas is provided in Appendix E-2 while information for the 75 areas still in need of delineation is provided in Appendix E-3. By 6/93, none of the local wellhead protection programs had finalized contingency plans. The 60 wellhead protection areas represent 17% of the community ground water supply systems and represents approximately 180,600 persons or 55% of the total population served by community public water supplies using ground water. The additional 75 initiated wellhead protection areas represent 21% of the supply systems and 28% (90,700) of the population with public ground water supply.

As the importance of raw ground water data becomes more and more evident and as our data management systems improve, better assessment and reporting can be done for future 305(b) reports.

COMPLETED/ONGOING STUDIES

The following discussion will summarize the results of: 1) A study in which pesticides were analyzed in rural wells of Berkeley, Monroe, and Greenbrier Counties, 2) A study in which pesticides were analyzed in rural wells of Mason, Wood, Pleasants, Tyler, and Wetzel Counties, 3) A Farm Bureau study, 4) A Ciba Geigy study, 5) Water Resources Data, West Virginia Water Year 1993 (USGS), 6) A study performed by the United States Geological Survey (USGS) on "Geohydrology, Water Availability, and Water Quality, with Emphasis on the Carbonate Area of Berkeley County, West Virginia" (WRIR 93-4074). 7) A graduate thesis on "Water Resources analysis of Canaan Valley, Tucker County. West Virginia" that was submitted by Mark D. Kozar to the Graduate School of West Virginia University.

(1) The West Virginia Department of Agriculture (WVDA), the state agency responsible for enforcement of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), conducted a study in several counties in West Virginia to determine the extent of pesticide and fertilizer use, and to determine the magnitude of pesticide contamination in ground water from each site's primary drinking water source. In 1991, this study was initiated and continued in 1992 and 1993. In 1991, the counties in which the study was conducted are Preston, Lewis, and Putman counties. A summary of the 1991 WVDA 106 Program report was included in the previous 305(b) Report in the Ground Water Section.

A program was established in 1991 to obtain data on the occurrence of pesticides in ground water based on crop production reports, existing data, and the number of certified private pesticide applicators. A target of 30% of the certified applicators from the designated counties was set and only rural water supplies were tested. A questionnaire developed by the EPA for the National Pesticides in Ground water Survey, adapted for the "1991 106 Program" was used in both the 1992 and 1993 studies. These efforts were done as a cooperative effort between the WV Department of Agriculture, and the WV Division of Environmental Protection.

In 1992 the "WV Department of Agriculture 106 Program" continued and three new counties were picked for the study. These counties were Berkeley, Greenbrier, and Monroe. A total of 95 participants were surveyed and 118 wells and 12 springs were documented, sampled, and analyzed. The majority of samples were taken in Berkeley County with 81. Twenty-five sites were tested in Greenbrier County and 24 in Monroe County. Sixteen water supplies tested positive for pesticides.

Of the sixteen sites with positive pesticide hits, 3 sites contained 2 separate compounds and a total of 5 separate compounds were detected. Follow-up samples were taken at all "positive" sites. Nine of the 56 follow-up samples contained detectable pesticide residues, with five sites being consistent with their initial sample, while the remaining 4 contained a dissimilar residue.

The five chemicals found were Atrazine, 2,4-D, 2,4,5-T, Picloram, and Triclopyr. Detections ranged from 0.53 ppb (parts per billion) to 0.01 ppb. All detections were well within acceptable levels. Picloram, used for brush control, was the most frequently detected compound with 11 detections ranging 1.0 to 0.1 ppb. A herbicide, 2,4-D, which has a wide range of uses as an agricultural and lawn and garden herbicide, was detected 7 times at ranges between 0.3 to 0.01 ppb. A corn weed control substance called Atrazine was also detected 5 times ranging between 1.4 to 0.02 ppb. Triclopyr, another herbicide used on brush, was reported at 4 sites at 0.01 to 0.02 ppb. A single detection of the discontinued herbicide, 2,4,5-T, was found at 0.01 ppb. All detections were within acceptable levels as recognized by the Environmental Protection

Agency. Appendix E-4 gives the results of the "positive" sites from both the initial and follow-up sampling events.

(2) In 1993, the "WV Department of Agriculture 106 Program" continued and new counties were picked for the study. These counties were Mason, Wood, Pleasants, Tyler, and Wetzel. "Mason County has historically had the largest number of certified private applicators. Wood County consistently remains in the top 10 counties in numbers of private applicators. Wetzel, Pleasant, and Tyler Counties are marginal areas that contain small agricultural operations in vulnerable alluvial areas that have not been sampled in a controlled program." (WVDA 106 Program 1993)

There were 128 participants surveyed and 141 wells and 19 springs were documented, sampled, and analyzed. Participation was much better than expected. Sample distribution were as follows: Mason County - 86 samples, Wood County - 45 samples, Tyler County - 18 samples, Pleasants County - 7 samples, and Wetzel County - 4 samples. There were only a few samples taken in both Pleasants and Wetzel Counties since a large number of the private applicators were serviced by public water systems.

After completion of the initial sampling, 16 sites had pesticide detections. Seven separate compounds were reported. The compounds detected were: Atrazine, Picloram, Triclopyr, 2,4,-D, Chlorpyrifos, Dieldrin, and Metolachlor. Overall detections ranged from 0.06 to 35.0 ppb with an average of 2.5 ppb. There was only one site with a detection exceeding its recommended maximum contaminant level (MCL). The compound was Dieldrin at 0.20 ppb. "A follow-up sample from this site and additional inspection of the site indicated that the detection may be linked to a chemical application for termite control." (WVDA 106 Program 1993)

Following is a breakdown of compounds, occurrences, and detection levels or ranges. The most frequently detected compound was Picloram with 7 detections ranging from 0.06 to 0.44 ppb. Atrazine was detected twice at 1.71 ppb and 1.10 ppb. The herbicide 2,4-D was reported at 3 sites at 0.34, 0.66, and 35.0 ppb. Triclopyr was found at 2 sites at 0.20 ppb and 0.33 ppb. Three separate compounds were detected each at one site. These were the herbicide Metolachlor at 0.76 ppb, the insecticide Chlorpyrifos at 0.10 ppb, and the insecticide Dieldrin at 0.20 ppb.

"Eight of the follow-up samples from sites that were reported as positive during initial sampling were positive for some type of pesticide. Six of the sites were consistent in that the same compound at approximately the same levels were reported. Two sites were reported as positive for different compounds. One site, which was reported as a single detection from the initial sampling, reported an additional compound. Seven sites were reported with no detections (ND). An Atrazine detection in excess of the MCL, which was reported from the follow-up, was re-sampled. The detection from this third sample was below MCL." (WVDA 106 Program 1993) Appendix E-5 gives the results of the "positive" sites from both the initial and follow-up sampling events.

(3) The Department of Agriculture (DOA) also worked together with the West Virginia Farm Bureau in a loosely structured sampling program. This program was initiated in 1991 and is an open-ended ongoing program. There has not been any activity since late 1993 for this program. This study was open to anyone with "rural", non-public supplied, water. Counties covered were Morgan, Clay, Mason, Wayne, Jackson, Lewis, Hampshire, Marshall, Preston, Hancock, Monroe, Brooke, Ohio, Tyler, Roane, Wetzel, Upshur, Wood, Pleasants, Mineral, and Pendleton.

The Farm Bureau contacted the Heiddleburg Water Quality Lab in Tiffin, Ohio, since they had worked with other agricultural organizations in the past. The basic test offered were nitrate, nitrite, ammonia, chloride, sulfate, soluble phosphorus, silica, and specific conductivity. Also offered was Immunoassay Screens for 6 commonly used herbicides. The WV Department of Agriculture laboratory performed a pesticide analysis on the samples.

Quality control of sampling was largely non-existent. New quart Mason jars were provided for sample containers. Participants picked up the jars and 2 smaller vials to be sent to Tiffin, Ohio. Once the samples were transported to the labs, standard QA/QC practices were used. Sample preservation was not done in the field which could have affected the results.

There were 75 total detections, although some of the follow-up sampling results identified some errors. The compounds detected were Chlordane - 23 hits, Triclopyr - 12 hits, Atrazine - 11 hits, Chlorpyrifos - 10 hits, Picloram - 10 hits, 2,4-D - 9 hits, 2,4,5-T - 1 hit, Malathion - 1 hit (questionable), Linuron - 1 hit (questionable).

(4) A controlled program with EPA protocols was initiated in 1993 and funded by the manufacturers of Atrazine, a widely used herbicide from Ciba Geigy. This program was initiated by the manufacturer of Atrazine. The main purpose was for Ciba Geigy to perform this study in order to maintain the registration of Atrazine. Since Atrazine has been a leading "bad actor" in ground water contamination, EPA requested that an environmental fate study on the parent compound and its analytes be performed. Ciba Geigy requested that they be allowed to do this study by working with state enforcement agencies to obtain the samples. All protocols were EPA approved. Analysis was done by the registrant's (Ciba Geigy) labs. About half of the samples were split and analyzed at the WV DOA labs.

The primary analytes tested for were Atrazine, Simazine, Prometon, Metolachlor, Ametryn, Prometryn and Nitrate. The program was intended to find analytes so site selection was based on areas with known use of the parent products or previous detections. A total of 87 wells were chosen, and due to some repeats, a total of 98 samples were taken and analyzed.

The final report is not complete at this time, but should be included in the next 305(b) report.

(5) Appendix E-6 provides a list of sites and parameter data from the publication "Water Resources Data, West Virginia, Year 1993," USGS Water Data Report WV-93-1. This data was from a special study performed by USGS.

(6) The United States Geological Survey performed a study on "Geohydrology, Water Availability, and Water Quality with Emphasis on the Carbonate Area of Berkeley County, West Virginia". (WRIR 93-4074) This report presents the results of this study. Following is information from the abstract and summary.

Carbonate rocks of Berkeley County include: the Elbrook Formation, Concococheague Formation, Beekmantown Group, Chambersburg Limestone, Hederberg Group, Tonoloway Formation, and Wills Creek Formation. Noncarbonate rocks include the Martinsburg Formation, Tuscarora Sandstone, Clinton Group, McKenzie Formation, Williamsport Formation, Oriskany Sandstone, Needmore Shale, Marcellus Formation, Mahantango Formation, Harrell Shale, Brallier Formation, Chemung Group, Hampshire Formation, and Pocono Group. Some karst topograpy has developed in the carbonate areas.

Ground water velocities varied depending upon geologic structure within the aquifer with the range being 32 to 1879 ft/d. For diffuse flow conditions, the mean flow velocity was 71 ft/d and for conduit flow conditions, 1139 ft/d. The

Beekmantown Group had 12 wells with yields over 100 gal/min and had the highest mean well yield at 48 gal/min. The mean, median, and maximum well yields decrease as the distance from a fault increases, indicating that well yield is directly related to the distance from a fault. Well yields typically decreased with increasing well depth. The highest median well yield was 30 gal/min for wells in carbonate rock and less than 50 feet deep. Wells that were in non-carbonate rocks between 50 and 99 feet had the highest median well yield of 21 gal/min.

The type of water most commonly found is calcium bicarbonate. This type of water source is from wells that are typically drilled in carbonate rocks and have higher hardness and higher median concentrations of dissolved constituents than in ground water wells drilled in non-carbonate rocks. These dissolved constituents are: total dissolved solids, calcium, sulfate, magnesium, chloride, nitrate, potassium, and fluoride. Higher dissolved constituents found in wells drilled in non-carbonate rocks are: silica, sodium, iron, and manganese. Springs from these certain rock formations are similar, only they are generally more dilute in concentrations.

Ground water from three springs near the tops of the mountains were diluted and acidic. The highest specific conductance was 65 uS/cm and the highest pH was 5.3. Two valley springs near the base of the mountains were analyzed and these had higher specific conductance and pH. The specific conductances were 335 and 610 uS/cm and the pH was 7.0 and 7.5. From the sampled springs, some constituents that exceeded their Primary and Secondary Maximum Contaminant Level (MCL's in the Federal Safe Drinking Water Standards) were: iron, manganese, nitrate, fecal coliform and fecal streptococcal bacteria, pH, total dissolved solids, and chloride. Each parameter was exceeded in at least one spring.

The ground water was also analyzed for organochlorine and organophosphate pesticides, and triazine herbicides, but results gave no concentrations that exceeded any Maximum Contaminant Level limits (MCL's in the Federal Safe Drinking Water Standards). Following are the compounds that were found in detectable concentrations at at least one spring site: chlordane, DDE, DDT, diazinon, dieldrin, endosulfan, endrin, heptachlor, heptachlor epoxide, malathion, atrazine, cyanazine, and simazine.

Radon was also analyzed and concentrations ranged from 92 to 1600 pCi/L.

7) A graduate thesis on "Water Resources Analysis of Canaan Valley, Tucker County. West Virginia" was submitted by Mark D. Kozar to the Graduate School of West Virginia University.

The purpose of this research was to evaluate the water resources, to determine the quality of water from ground and surface water sources, to determine major factors (both geochemical and anthropogenic) that affect the water quality, and to qualitatively assess availability of ground and surface waters in Canaan Valley. Following will be a brief summary of some of the findings as they pertain to ground water.

About 75% of the waters used in the Canaan Valley area were for golf course irrigation, motel operations, and snow making. Most of the domestic water supplies came from private ground water wells. Ground water recharge was estimated from hydrograph analysis at 0.892 Mgal/dy/sq mi. It is estimated that less than 1% of the available ground water resources are being used.

Water quality in the Canaan Valley is relatively good with a few exceptions. There are several occurrences that can affect the ground water quality in the Canaan Valley. One process is the dissolution of calcite and dolomite within the Greenbrier and Pocono aquifer zones which tends to result in higher pH, calcium, magnesium, and total dissolved solids.

Another impact on water quality can be caused by "Reducing Conditions". During these conditions an increase in iron and manganese concentrations occur. This is often found within the Pocono aquifer zone. High concentrations of fecal streptococcus and fecal coliform bacteria and also higher nitrates can be found due to human and animal fecal wastes. Another source for higher nitrates and sulfates in ground water comes from acid precipitation, which can also cause higher ammonia concentrations. High concentrations of dissolved radon gas were found in some wells in the Pottsville/Mauch Chunk and Pocono aquifer zones.

From ground water sampling and analysis, only 2% of the ground water sites sampled had iron concentrations in excess of the EPA secondary MCL. There were about 20% that had higher concentrations of Manganese than the recommended secondary MCL standard. More than 3/4ths of the surface waters sampled exceeded MCLs for both iron and manganese. A little over 20% of sites sampled showed a measurable quantity of fecal bacteria and almost 50 percent had detectable fecal streptococcus bacteria. Approximately 67% of the sites sampled contained radon in excess of the recommended amount of 300 pCi/L proposed EPA MCL.

CONCLUSION:

West Virginia is moving forward in ground water protection via federal, state, and local efforts. Passage of the Groundwater Protection Act is a significant development. Although full implementation of the new legislation may not occur before the next 305(b) reporting period, much progress has been and will be made toward effectively managing the state's ground water resources.

The Groundwater Protection Act requires all ground water regulatory agencies to routinely store all ground water data in a centralized location. When this data management system becomes operational and GIS technology is employed, we may then be able to better understand the status of West Virginia's ground water quality.

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PART V. 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 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 combined with emphasis on water quality controls has resulted in continued pollution reduction in all state waters. It also has provided states with a greater measure of regulatory authority in requiring additional reductions in effluent loadings of these pollutants. BAT limits are often adequate to protect water quality because the majority of major dischargers are located on large rivers which have a greater 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 a greater degree of pollutant control, particularly in relation to toxic substances.

In addition to enabling the Office of Water Resources to correct problems, state regulations contain approval procedures for proposed industrial wastewater connections to publicly owned treatment works (POTWs). This allows the Office 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. As time and staffing permits, these reports are reviewed and, where noncompliance exists, administrative action is often taken. This may include issuing warning letters, notices to comply, enforcement orders, or referrals for civil action.

The Office 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 the Office is accurate. During this reporting period (July 1989-June 1991) about 146 laboratories (coal, commercial, industrial, and municipal) were inspected by Water Resources personnel.

To address the discharge of toxic pollutants, the state Water Resources 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 major effort within the Office to address toxic discharges is an increase in the toxicity testing program. Testing is performed by the Program Management/Technical Support (PM/TS) Branch in coordination with the Permits Branch. 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. This has led to the reduction of toxic pollutants in the permit reissuance process via an increased use of toxicity testing as well as the setting of toxic effluent limitations in permits.

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).

The Office of Water Resources supports a field inspection staff as part of the agency's Environmental Enforcement 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 truck wrecks, chemical 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 the Attorney General's office. This type of enforcement action is very time consuming and is usually taken as a last resort.

Inspection of activities covered under the erosion control 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. Inspector activities in this area are closely coordinated with the PM/TS Branch's nonpoint source personnel.

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.

A summary of inspector activities during the two-year report period is given in Table V-1. Inspections of coal-related and other resource extraction activities are the responsibility of the Office of Mining and Reclamation.

Table V-1

Environmental Enforcement Activities
July 1991 - June 1993

(grant commitment number in parentheses)

Activity	Number
A. Report:	
- Enforcement letters and notices issued	1006
- Criminal enforcement actions initiated	96
- Administrative actions recommended	36
- Civil actions recommended	0
B. Prepare:	
- Reports of Investigation	36
- Monthly prosecution reports (24)	24
- Monthly enforcement letter reports (24)	24
C. Investigate:	
- Complaints	2,709
- Spills	1,026
- Aquatic life kills	70
D. Conduct:	
- Field reviews of permit applications	161
- Compliance Evaluation Inspections (220)	222
- Sewage treatment plant walk through inspections (2,660)	4,531
- Industrial waste treatment plant walk through inspections (810)	1,199

Chapter Two: Nonpoint Source Control Program

The Water Quality Act of 1987 mandated that states develop and implement programs for the control of nonpoint sources of pollution. With the enactment of Section 319 of the Act, new direction and significant federal financial assistance for the implementation of state nonpoint source (NPS) programs was authorized. The Act required two major reports to be prepared by the states: (1) a State Assessment Report describing NPS water quality related problems, and (2) a State Management Program explaining how NPS problems will be addressed in the future.

The Nonpoint Source Assessment Report was completed and approved by EPA during 1989. In this report, nonpoint source impacts were identified in 1,673 streams. Further land use assessments identified 29 priority watersheds with agricultural or construction activities impacting water quality and 23 watersheds impacted due to a high incidence of repeat forest fire burns.

The most imposing water quality problem is abandoned coal mine drainage. Ninety six (96) watersheds were found to be suffering from mine drainage impacts.

The Nonpoint Source Management Program Plan also was completed and approved by EPA during 1989, thereby meeting the second part of Section 319 requirements of the Water Quality Act of 1987. The management plan is composed of several stand-alone documents prepared for the categories of silviculture, resource extraction, agriculture and construction. Each management program contains objectives designed to increase industry's understanding and awareness about protecting water quality during operations. The management program's purpose is to establish the mechanisms within the infrastructure of government that can be used to deal with the complex problem of nonpoint source pollution.

The DEP's Office of Water Resources, 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 from agricultural, silvicultural, resource extraction, and construction activities. The Office of Water Resources is organized in such a way that the Clean Lakes Program, the 305(b) process, and the Ambient Water Monitoring Program are under the Nonpoint Program, which facilitates data transfer and communication among these related programs. Program initiatives are based upon education, technical assistance, financial incentives, demonstration projects, and regulation.

Under new guidance prepared by EPA for the 319 Program, grant funds are split between a Base Program and Competitive Projects designed to address specific watershed NPS problems.

West Virginia's base program supports the overall administration and coordination of the Nonpoint Source Program in the participating state agencies: Office of Water Resources (lead agency), Office of Mining and Reclamation, Soil Conservation Committee, and Division of Forestry. Update of the Management Plan this year will include urban nonpoint sources and hydromodification. There are specific activities in agriculture, construction, and silviculture, funded under the base program. Following is a description of each base program component:

<u>WVDEP-OWR NPS Base Program--Administration and Coordination</u>

The state Office of Water Resources, as the lead agency, manages and coordinates the statewide nonpoint source program, overseeing activities of the various cooperating agencies (Division of Forestry (DOF), Soil Conservation Agency (SCA), and Office of Mining & Reclamation (OMR)).

WVDOF Base Program--Implementation Grant

The state Division of Forestry will continue its current NPS activities and implement new silvicultural NPS management programs on a statewide basis.

WVDEP-OMR NPS Base Program--Administration and Coordination

The state Office of Mining & Reclamation coordinates the NPS pollution program for the resource extraction category. Major responsibilities include overseeing implementation of the NPS resource extraction program, and revising the resource extraction section of the state NPS Assessment Report and NPS Management Program Plan.

WVSCA NPS Program Coordinator

The state Soil Conservation Agency has broad responsibilities for coordination of the statewide NPS water quality activities relating to agriculture and construction.

The competitive projects in West Virginia emphasize streambank stabilization, construction and agricultural practices, resource extraction, and education. Following is a description of the ten projects in the competitive program:

Save Our Streams Program

The Izaak Walton League of America, with oversight from the Office of Water Resources, coordinates a program for citizen participation in monitoring West Virginia's streams.

Bioengineering BMP/Streambank Stabilization Demonstration Project/South Branch of the Potomac River

A streambank stabilization demonstration project will be carried out to educate landowners about the problem of sedimentation from eroding streambanks. Various biological and mechanical streambank stabilization practices will be explained and tested.

Cedar Lakes Multi-State NPS Resource and Training Center

The Cedar Lakes training facility, which can hold up to 300 participants at a time, will be used to educate and train technicians, professionals, and interested citizens about specific NPS issues and use of best management practices.

WVSCA Kanawha River Basin Nutrient and Pesticide Demonstration Project

This project will emphasize dissemination of information to the public concerning protection of water quality by waste and water management, soil conservation, and pesticide control. Key activities will involve developing nutrient management plans, designing animal waste holding facilities, providing technical assistance regarding use of plant cultivars with increased insect/disease genetic resistance, and developing IPM/IPC plans.

WVSCA Wheeling Creek/Tomlinson Run Watershed Demonstration Project

Activities include overseeing streambank and roadbank stabilization projects, reviewing sediment and erosion control plans, conducting sediment and erosion control workshops, and training volunteers to monitor water quality.

WVSCA Potomac Valley and Eastern Panhandle Nutrient and Pesticide Management Demonstration Project

Information and education activities will be used to promote sustainable agricultural methods and proper usage of nutrients and pesticides to protect water quality. The program also involves development of alternatives for using poultry litter, installation of dead bird/manure composting facilities, a disposal program for unused pesticides and containers, sinkhole capping, and construction of wetlands to treat animal waste leachate.

WVSCA Preston County Nutrient and Pesticide Demonstration Area

Control of animal waste, nutrients, and chemicals will be addressed through information and educational activities, writing management plans, testing plant nutrient uptake, testing storage facilities, and stream monitoring.

Middle Fork River Watershed National Pilot Demonstration Project

Funds will be used to evaluate and implement acid mine drainage abatement technology at sites identified as causing major stream degradation. Funds will be used for obtaining current land use classifications inside the project area, completing mapping of old underground and surface mine sites permitted by the Office of Mining and Reclamation, developing water quality predictive GIS modeling, and designing and installing natural abatement structures to control sources of contamination.

WVSCA Southern Construction Demonstration Project

The goal of this project is to reduce the amount of stream sedimentation that occurs as a result of construction activities in the demonstration area.

WVSCA Milton Construction Demonstration Project

The ultimate goal of this project is to improve the water quality within the project area by reducing erosion on construction sites and other disturbed areas.

Based on the need for water quality improvement, special emphasis will be placed on increasing implementation efforts in those watersheds identified in the state NPS Assessment. The Office of Water Resources and its cooperating agencies will:

> conduct intensive water quality surveys to provide baseline data

> locate and map individual nonpoint sources within the watershed

> use intensive application of existing programs to push implementation of appropriate BMP's

> conduct follow-up water quality surveys to measure the success of efforts

The process utilized for selecting priority watersheds involved several key resources. The main body of information was obtained from the 1989 West Virginia nonpoint source assessment report. Numerous state and federal government agencies, along with citizens and environmental groups participated in compiling and approving the information documented in the Nonpoint Source Assessment.

Data generated from several DEP monitoring programs that was utilized to update the NPS Assessment report was reviewed by three OWR staff members with over 40 years combined work experience in water quality monitoring. The result of the above efforts was the establishment of a prioritized list of NPS watersheds and associated sources of impairment.

Two important premises upon which the process was based are 1) that streams with relatively few nonpoint source problems, but with high potential for degradation, should be protected and 2) that streams which are currently suffering extensive harm from nonpoint sources should be addressed so that mitigative measures can be determined.

A key consideration in development of the priority list is the policy of the state of West Virginia to maintain water quality standards and designated stream uses as approved by the state Water Resources Board consistent with 1) public health and public enjoyment thereof and 2) the propagation and protection of animal, bird, fish, and other aquatic and plant life.

Nonpoint source pollutant sources are numerous and varied in West Virginia just as they are in the rest of the world. Nonpoint pollutant sources which were considered in the prioritization process include: Logging (existing), logging (potential), habitat degradation, acid mine drainage (metals), acid mine drainage (acidity), mining (potential), oil & gas extraction (existing), oil & gas extraction (potential), chemical seepage and runoff, construction activities (existing), construction activities (potential), agricultural activities (including animal feed lots, crop production, animal husbandry, and application of chemicals and animal waste to the land), state Soil Conservation District agriculture and construction priority, highway construction runoff, and acid deposition.

Other factors considered in development of the NPS priority list include: Streams which harbor endangered species or that have particularly diverse biological communities, amount of available water quality data, regional and interstate importance of the watersheds, the significance of groundwater impacts, and the presence of citizen monitoring groups interested in particular watersheds.

Table V-2 contains a list of NPS watersheds that are in the top 20 percent of watersheds threatened or impacted by nonpoint sources. This list is not static, but is subject to periodic revision as situations warrant. It is intended only as a reference for annual submittal of NPS priority comprehensive watershed projects. The watersheds themselves are not ranked in any particular order. Numbers appearing beside the watershed names are identification numbers assigned by the U.S.D.A. Soil Conservation Service. The geographical location of each watershed is provided in Figure V-1.

Table V-2. NPS PRIORITY WATERSHED LIST

WATERSHED	SUB	ACREAGE	ELOG	PLOG	HABD	AMDM	AMDA	PMIN	EDGE	POGE	CHSR	ECON	PCON	AGRA	SCAC	HWCR	ADEP	BIOS	RIIM	GRWS
S. Branch Potomac	25	218000											X	X	X				X	
Potomac Direct	17	25500										X	X	X					X	X
Potomac Direct	19	47400										X	X	X					X	X
Lower Cacapon R.	5	38300		X									X	X				X	X	
North River	6	130800		X									X	X				X	X	
Cacapon River	7	117200		X									X	X				X	X	
Lost River	8	117200		X									X	X				X	X	
Trout Run	9	30000		X									X	X				X	X	
Upper Middle Fork	52	50350	X	X				X		X				X			X	X		
Buckhannon River	53	94800	X	X				X		X				X			X	X		X
Lower Middle Fork	54	45650	X	X				X		X				X			X	X		X
Big Sandy Creek	62	48650	X	X		X	X	X		X				X		X	X		X	X
Little Sandy Ck.	64	34100	X	X		X	X	X		X				X		X	X		X	
Muddy Creek	65	100900	X	X		X	X	X		X				X		X	X		X	
Blackwater River	74	90150	X	X		X	X	X		X				X		X	X		X	
Patterson Creek	1	181250	X	X		X	X	X						X	X		X		X	
Potomac Direct	20	25200	X	X		X	X	X						X			X		X	X
Stony River	21	37250	X	X		X	X	X						X			X		X	X
Abram Creek	22	49860	X	X		X	X	X						X			X		X	
Roaring Creek	61	18750	X	X	X	X	X	X	X	X			X	X				X		X
Dunloup Creek	193	31150	X	X	X	X		X		X		X	X	X		X	X	X		
Spruce Laurel Fk.	248	84900	X	X	X	X	X	X			X	X	X					X		
Manns Creek	195	36350	X	X	X	X	X	X				X						X		
Wheeling Creek	120	88570	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	
Little Sandy Ck.	228	32450	X	X					X	X		X	X			X		X		X
Big Sandy Creek	231	86850	X	X	X				X	X		X	X	X		X		X		X
Buffalo Creek	236	72950	X	X	X	X	X	X	X	X		X	X				X			X
Blue Creek	229	50800	X	X	X	X	X	X	X	X		X	X							X
Tygart Direct	42	54300	X	X		X	X	X	X	X		X	X	X		X	X	X		X
Three Forks Ck.	43	64100	X	X		X	X	X	X	X		X	X	X		X	X	X		
Sandy Creek	44	56300	X	X		X	X	X	X	X		X	X	X		X	X	X		
Kanawha R. Direct	162	26250	X	X	X	X	X	X			X	X	X	X		X		X		X
Kanawha R. Direct	169	21850	X	X	X	X	X	X			X	X	X	X		X		X		X
Laurel Creek	47	35400	X	X		X	X	X	X	X		X	X	X		X	X	X		
Tygart Direct	48	52850	X	X		X	X	X	X	X		X	X	X		X	X	X		X
Shooks Run	59	1900	X	X		X	X	X	X	X		X	X	X		X	X	X		
French Creek	60	31400	X	X		X	X	X	X	X		X	X	X		X	X	X		
Gauley R. Direct	211	81100	X	X	X	X		X		X		X	X	X		X	X	X		X
Hominy Creek	216	66250	X	X	X	X		X		X		X	X	X	X	X	X	X		X
Muddlety Creek	217	42250	X	X	X	X		X		X		X	X	X		X	X	X		
Beaver Creek	219	24850	X	X	X	X		X		X		X	X	X		X	X	X		
Kanawha R. Direct	163	31900	X	X	X	X	X	X			X	X	X	X	X	X		X		X
Goose Creek	91	43100	X	X					X			X	X	X		X				
Hughes R. Direct	92	50450	X	X					X			X	X	X		X				
Bonds Creek	93	9450	X	X					X			X	X	X		X				
Little Kan. Dir.	113	105000	X	X				X		X				X			X	X		
W.V.Fork-Fish Ck.	126	17850	X	X	X	X	X	X	X	X	X	X	X	X		X		X	X	
PA.Fork-Fish Ck.	125	79900	X	X	X	X	X	X	X	X	X	X	X	X		X		X	X	
Lower Meadow R.	214	101300	X	X	X	X		X		X		X	X	X		X	X	X		
So.Fk. Hughes R.	96	113850	X	X					X			X	X	X		X				
Teays Valley	168	51150	X	X	X	X	X	X			X	X	X	X	X	X		X		
Old Town Ck.	150	27400	X	X	X				X	X	X	X	X	X		X		X	X	X
-report total		3175480																		

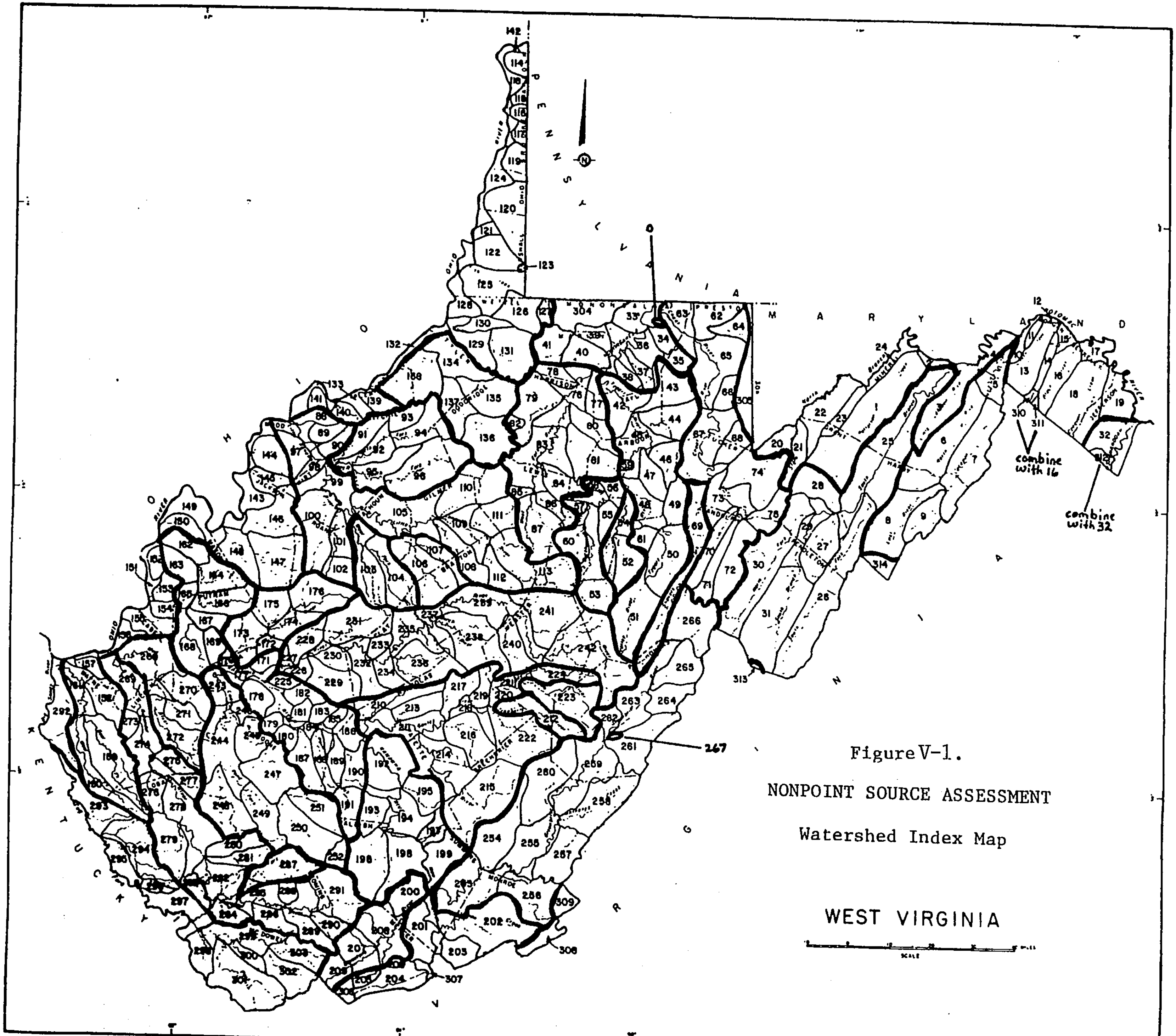

Figure V-1.

NONPOINT SOURCE ASSESSMENT

Watershed Index Map

WEST VIRGINIA

Chapter Three: Cost/Benefit Assessment

The cleanup of wastewater from municipalities and public service districts in West Virginia has progressed at a moderate pace since 1972, when the Clean Water Act was passed. Between 1972 and 1994, 216 projects have been constructed consisting of 124 treatment plants and 92 separate sewage collection systems. The total cost for all of these projects was more than $1 billion. EPA grants and WV State Revolving Fund loans provided more than $667 million of the total funding.

Since 1991, the EPA Construction Grants Program closeout has continued. Final closeout of all funded projects is expected to be completed by 1998. To replace the grants program, the new WV State Revolving Fund low interest loan program has been established as the primary funding source for municipal wastewater projects. Since the first loan was made in November, 1991, the SRF has committed over $77 million to 32 projects.

Another indication of progress in water pollution control is the treatment status of the state's 39 major municipal facilities (one million gallons-per day (MGD) flow or more). In 1972, 76 percent of these major facilities were not in compliance with the federal Water Pollution Control Act. Now, 38 of the 39 facilities have constructed at least secondary treatment. The remaining facility has received a grant to upgrade to secondary standards. As a result of better sewage treatment, an increase in game fish populations and recreational use has been achieved on many streams.

During the 1991-1993 reporting period, 16 sewage treatment plants were either constructed or upgraded at a total cost of $66 million. In addition, nine sewage collection systems were either built or renovated at a total cost of $19 million. The 25 projects mentioned above were partially funded using $39 million in EPA grants and $23 million in State Revolving Fund loans. OWR's Construction Assistance Branch administers these two programs.

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 Certification) permits, 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 Bureau of Public Health has input on municipal facilities and oversees all activities associated with home septic systems in cooperation with county sanitarians. The state 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 agency expenditures for FY 89-90:

Division of Environmental Protection	
Office of Water Resources (State + Federal)	$ 6,247,651
Office of Mining and Reclamation	$ 801,000
Office of Waste Management	$ 4,500,000
Division of Natural Resources	
Wildlife Resources Section (approximation)	$ 110,000
Bureau of Public Health (Includes Co. Sanitarians)	$ 2,000,000
Water Resources Board	$ 121,000
TOTAL	$13,779,651

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 has released information on the economic impact of fishing in West Virginia. The figures are based on 1991 reports by the U.S. Fish and Wildlife Service, U.S. Bureau of the Census, Sport Fishing Institute, and WV Division of Natural Resources. The reports indicate that in 1991, residents and non-residents spent over $104,329,000 in West Virginia for fishing. These expenditures were for items such as food, lodging, transportation, fishing equipment, etc. The total economic impact of these expenditures amounted to $178,140,000. This impact maintained 3,380 jobs and generated wages amounting to $51,133,000. Expenditures generated $6,260,000 in state sales taxes and $972,000 in state income tax. Fishing and related licenses generated $4,099,145 in 1991. 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 identify waters that do not meet designated uses or water quality standards, and determine their relative degree of impairment. Monitoring data are used to support the agency's permitting, enforcement, and planning activities.

General monitoring activities (ambient and mini-ambient networks, biological network, fish tissue sampling, groundwater characterization, lake assessment, and intensive surveys) are coordinated by individual programs within the Office of Water Resources. DEP's Office of Environmental Enforcement (OEE) oversees all 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. Details on benthic surveys, toxicity tests, and fish tissue sampling are contained in Appendix E.

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. During a typical year, samples for metals and pesticide analyses are collected from 20-25 sites (two samples per site, each comprised of five fish) throughout the state. As a result of the inability to obtain in-house analytical work, this program has in essence been restricted to those waters posing a threat to human health by way of fish consumption. These efforts have primarily focused on the Ohio and Kanawha rivers during this reporting period. Fish tissue sampling results may be found in Appendix F.

Ambient Water Quality Monitoring

Ambient water quality continued to be monitored monthly at 27 fixed sites (Table V-2) across the state during the reporting period. The information gathered is useful in assessing long-term trends and measuring differences between upstream and downstream stations on several 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.

The 27-site, long-term water quality network is supplemented by several other monitoring programs. The implementation of regional "mini-networks" has taken place over the past eight years. This program focuses on water quality in small streams, rather than major rivers (as with the long-term trend network), providing monthly data for a continuous 12-month period for each station sampled. Due to laboratory constraints, only 20 sites were sampled during this reporting period. Mini-network samples are usually collected by OEE field inspectors in each district where a stream has been targeted. At the end of each one-year sampling period, efforts are shifted to new streams for which recent data do not exist. Parameter coverage is very similar to that for the long-term trend network except that additional metals samples are collected during the months of July, August, and September. The state believes this program provides information that is extremely valuable for use in the preparation of this report.

Table V-3

Sample Locations
Ambient Water Quality Network

WV CODE	DESCRIPTION
LK-28	Little Kanawha R. at WV Rt. 5 bridge at Elizabeth (midstream)
K-31	Kanawha R. at Winfield Locks (near L. bank)
K-73	Kanawha R. at Chelyan bridge (midstream)
KC-11	Coal R. at Kanawha Co. Rt. 9 bridge in Tornado (midstream)
KE-004	Elk R. in outside bend about 50 yds. upstream of Coonskin Br. (L. bank)
KG-08	Gauley R. at Nicholas Co. Rt. 39/1 bridge in Beech Glen (midstream)
KN-01	New R. at C&O RR bridge, Gauley Bridge (near L. Bank)
KNG-006	Greenbrier R. at WV Rt. 3 bridge, Hilldale (midstream)
OG-3	Guyandotte R. at Cabell Co. Rt. 26 bridge, Huntington (midstream)
BST-000	Tug Fork at WV Rt. 37 bridge, Fort Gay (midstream)
M-07	Monongahela R. at U.S. Rt. 19 bridge in Star City (midstream)
MC-32	Cheat River at WV Rt. 26 bridge, Albright (midstream)

Table V-3 continued

WV CODE	DESCRIPTION
MC-79	Cheat R. at Tucker Co. Rt. 1 bridge below Parsons (midstream)
MT-006	Tygart Valley River, Rt. 62 bridge, Colfax (midstream)
MT-091	Tygart Valley River at U.S. Rts. 219 and 250 bridge above Beverly (midstream)
MW-12	West Fk. R. at Harrison Co. Rt. 19/2 bridge off U.S. Rt. 19 in Enterprise (midstream)
PSB-13	So. Br. of Potomac R. at Hampshire Co. Rt. 3 bridge near Springfield (midstream)
S-001	Shenandoah R. at U.S. Rt. 340 bridge in Harpers Ferry (midstream)
PC-6	Cacapon R. at Morgan Co. Rt. 7 bridge near Great Cacapon (midstream)

Ohio River (8 locations):

Ohio River Stations are contracted to ORSANCO. These sites are all CORE stations and are spread throughout the West Virginia portion of this major waterway; they effectively bracket several target areas influenced by major industrial complexes, municipalities, and tributaries. Locations are described below (mile points from headwaters at Pittsburgh):

Ohio R. along right bank at East Liverpool Water Works - M.P. 40.2

Ohio R. at Pike Island L & D - M.P. 84.2

Ohio R. at Hannibal L & D - M.P. 126.4

Table V-3 continued

Ohio R. at Willow Island L & D - M.P. 161.8

Ohio R. at Belleville L & D - M.P. 203.9

Ohio R. at Addison, Ohio - M.P. 260.0

Ohio R. at Gallipolis L & D - M.P. 279.2

Ohio R. at Showboat Marina dock 1/4 mile upstream of WV American - M.P. 306.6

The following water quality constituents are measured at each location in the ambient network:

Temperature	Manganese
Dissolved Oxygen	Aluminum
Flow	Suspended Solids
Hot Acidity	Fecal Coliform Bacteria
Total Alkalinity	Iron
Sulfates	TKN
Conductivity	(NO2 + NO3)-N
PH	Total Phosphorus

Biological Monitoring

Ambient biological monitoring was conducted during the reporting period on a statewide basis. The long-term biological network consists of 42 sites at which aquatic invertebrates are collected biennially (Table V-3). A number of these sites overlap with the 27 long-term chemical monitoring sites, enabling DEP to make comprehensive evaluations on many of the state's waters. This biological information is stored on EPA's mainframe in the BIOS data system.

A number of benthic (aquatic invertebrate) surveys were conducted during the period to address a variety of concerns. Sampling of this type is generally conducted upstream and downstream of a suspected influence to water quality. Changes in water quality are reflected in the aquatic community. A typical survey involves collection and identification of all invertebrates within a defined area at each sample site along with a representative water sample for chemical analyses. A habitat assessment is also performed at each site. Twenty benthic surveys were conducted during the two-year reporting period. The majority of this work was done in support of NPDES permit issuance. The field methods utilized generally follow those outlined in EPA's Rapid Bioassessment Protocols (U.S. EPA, 1989). Benthic survey results are included in Appendix F.

Black Fly Control Program

The black fly control program was initiated in the mid-1980's to control nuisance populations of these biting flies. Black fly larvae are aquatic and reside in the rapids of streams and rivers. The adults are small gnats. An adult must have a blood meal to become reproductively mature. The black fly populations have the highest density in the Hinton area of Summers County, where three large streams (the New, Greenbrier, and Bluestone rivers) converge.

Table V-4

Macroinvertebrate Sampling Stations

Basin/ WV Code	Station Location
OHIO RIVER	
0-233	Ohio River at Newell, WV
0-232	Ohio River at Pike Island L & D*
0-191	Ohio River at Hannibal L & D
0-155	Ohio River at Willow Island L & D
0-113	Ohio River at Belleville L & D
0-057	Ohio River at Addision, OH
0-037	Ohio River at Gallipolis L & D
0-012	Ohio River at Huntington, WV
OG-003	Guyandotte River at Huntington, WV
OG-034	Guyandotte River at Branchland, WV
OG-135	Guyandotte River at Wyoming, WV
LITTLE KANAWHA RIVER	
LK-015	Little Kanawha River at Slate, WV
KANAWHA RIVER	
K-02	Kanawha River at Henderson, WV
K-31	Kanawha River at Winfield L & D
K-83	Kanawha River at London L & D
KP-008	Pocatalico River at Lanham, WV
KC-11	Coal River at Tornado, WV
KE-004	Elk River at Mink Shoals, WV
KG-008	Gauley River at Jodie, WV
KN-01	New River at Gauley Bridge, WV
KN-95	New River at Glen Lyn, VA
KNG-006	Greenbrier River at Hilldale, WV
KNG-136	Greenbrier River at Cass, WV
KNB-23	Bluestone River below Brush Creek

Table V-4 continued

Basin/ WV Code	Station Location
MONONGAHELA RIVER	
M-07	Monongahela River at Star City, WV
MC-32	Cheat River at Albright, WV
MC-79	Cheat River at St. George, WV
MCB-04-01	Blackwater River at mouth
MCB-04-11	Blackwater River at Blackwater Falls State Park
MCS-00	Shavers Fork at mouth
MW-12	West Fork River at Enterprise, WV
MT-006	Tygart Valley River at Colfax, WV
MT-023	Tygart Valley River below Tygart Lake
MT-091	Tygart Valley River at Beverly, WV
MTB-07	Buckhannon River at Hall, WV
MTM-33	Middle Fork Tygart Valley River near Adolph, WV
POTOMAC RIVER	
S-001	**Shenandoah River at Harpers Ferry, WV
PSB-013	**S. Branch Potomac River at Springfield, WV
PSB-054	**S. Branch Potomac River at Moorefield, WV
P-030-02	**Opequon Creek near Bedington, WV
PNB-076-06	Stony River near Mt. Storm, WV
BIG SANDY RIVER	
BST-000	Tug Fork River at Fort Gay, WV

* L & D = Locks and Dam.

**Phytoplankton samples also collected at site.

A bacterium called Bti (Bacillus thuringiensis isrealensis) is used to control the black flies in the aquatic larval stage. When Bti is consumed by an organism having an alkaline gut pH, a chemical reaction occurs, resulting in the destruction of the digestive tract. Few aquatic organisms beside black flies and mosquitoes have an alkaline gut pH.

Beginning in March of each year, biologists monitor streams in the Hinton area to evaluate the growth of the black fly larvae. Black flies are most active feeders during their fifth growth stage, or instar, and it is during the fifth instar that Bti application will have the greatest impact on the larvae. Biologists use such factors as larval size and stream temperature to estimate the best date for ti application.

The Bti is applied via helicopter to fixed sites on the Greenbrier, New, and Bluestone Rivers. Water Resources biologists tell the pilot how much Bti to apply and which sites need to be treated. Since black flies from outlying areas can fly into the treatment area and quickly repopulated the streams, Bti applications must be repeated throughout the summer. Typically, seventeen applications are performed between March and October.

INTENSIVE SURVEYS/SPECIAL STUDIES

Elk River Mussel Survey

An intensive effort was begun in 1991 to survey the mussel fauna of Elk River. Pleurobema clava (clubshell) was found at several sites from which it was collected historically and at a few new locations. This mussel is listed as an endangered species by the U. S. Fish and Wildlife Service. In addition to that species, shells of Villosa fabalis and Epioblasma triquetra (one of each) were found. Both are very rare in West Virginia. More recent investigations conducted by consulting biologists for private industry resulted in the discovery of two specimens of Epioblasma rangiana (northern riffleshell), an endangered species.

Miscellaneous Mussel Surveys

In 1993, an investigation of the effects of a major mine discharge into the Ohio River via a tributary located in the state of Ohio, resulted in the discovery of a living specimen of Lampsilis abrupta (pink mucket), an endangered species. Also in 1993, a Water Resources employee was responsible for locating the largest known population of Alasmidonta varicosa found to date. The population is located in Patterson Creek (Potomac Basin) but the species, which is currently under study as a candidate for endangered or threatened status, is also found in the Cacapon River.

The Office of Water Resources participated in a survey of mussels in Dunkard Creek (Monongahela Basin) conducted in 1993 as a cooperative effort between Pennsylvania and West Virginia agencies. Fourteen species were found, including two candidates for threatened or endangered status, Epioblasma triquetra and Simpsonaias ambigua (salamander mussel). OWR also conducted sampling in the Potts Creek drainage of the James River Basin to determine water quality conditions associated with the endangered James spinymussel (Pleurobema collina).

Upper Little Kanawha River Study

The headwaters of the Little Kanawha River were sampled every other month for a 12-month period in 1992 and 1993. The river and its tributaries above Burnsville Lake are characterized by low alkalinity, depressed pH, low conductivity, and low temperature.

Mid-Atlantic Highlands Assessment (MAHA)

West Virginia biologists, along with counterparts in Virginia, Maryland, Pennsylvania, Delaware, and Washington D.C., participated in this study. MAHA combines a number of monitoring designs and will ultimately provide environmental assessment tools that will integrate such diverse factors as land cover, man-made impacts, and aquatic and terrestrial ecosystems so that a "hilltop to hilltop" assessment of a given stream segment can be evaluated. These new assessment tools will ultimately result in improved environmental management.

Kanawha River Lead Study

In July through October of 1992, a survey was conducted on the Kanawha and Ohio rivers at the point of confluence to determine if lead from the Kanawha was impacting Ohio River water quality. The survey was initiated in response to sampling conducted by ORSANCO, which indicated that lead may be violating water quality criteria in the lower Kanawha.

The ORSANCO Compact, which all Ohio River border states are signatory to, states that water quality in Ohio River tributaries must be equal to or better than water quality in the mainstem Ohio. The state of West Virginia, concerned that Kanawha River water quality may be violating the ORSANCO Compact, initiated an intensive survey to characterize ambient lead in the Ohio and Kanawha Rivers at the point of confluence.

The 1992 survey did reveal ambient Kanawha River lead concentrations in violation of state criteria. However, violations were also noted in the Ohio River above the point of confluence, indicating a potential lead source other than the Kanawha River. No definitive conclusions were drawn from such limited sampling.

In 1993, a second survey was conducted to further characterize ambient lead in the Kanawha and Ohio rivers. For this survey, the number of sampling points on the Kanawha was increased from one to six. Violations of lead criteria were noted at each sampling point, with the lowermost downstream point exhibiting the greatest frequency of violation. The source of lead in the Kanawha River is undetermined. However, OWR does not feel it is related to point sources. Further study will be necessary to determine the probable source as well as the extent of lead contamination in the Kanawha River.

Monitoring Related Activities

Toxicity testing efforts continued throughout the reporting period. This work is generally conducted in conjunction with compliance sampling inspections. About 150 tests are run each year. Fathead minnows and water fleas are used for bioassay tests, which measure the degree of toxicity of effluents and/or ambient waters. In most of the tests, organisms are subjected to a 48-hour exposure period. Toxicity test results for this reporting period are provided in Appendix F.

Performance audit inspections were conducted on laboratories that perform toxicity tests for West Virginia's NPDES permittees. The purpose of these audits is to assure that the laboratories are conducting tests according to standard EPA/State protocols, and that they are qualified for state certification. Two laboratories were audited. One of these was a new facility which was not in full operation at the time of the audit. The other was granted certification for acute testing only. Proficiency testing will be necessary before chronic testing certification can be granted.

LITERATURE CITED

Plafkin, J.L., M.T. Barbour, K.D. Porter, S.K. Gross, R.M. Hughes. 1989. Rapid Bioassessment Protocols for Use in Streams and Rivers. EPA-444/4-89-001. U.S. Environ. Prot. Agency, Washington, D.C.

Chapter Five: Special State Concerns and Recommendations

Special State Concerns

Following is a list and description of the state's major concerns regarding water quality and pollution control.

A. Abandoned Mine Drainage

Drainage from abandoned coal mines continues to be a serious water pollution problem throughout West Virginia. Mine drainage not only renders receiving streams useless by acidification, but also may be a source of toxic metals, sulfates, and other pollutants. This problem is most severe in the Monongahela River Basin, for which assessment reports have been prepared for the Monongahela River mainstem (1985), West Fork River (1983), Tygart Valley River (1982) and Cheat River (1981). The State's 1989 Nonpoint Source Assessment indicates that a minimum of 484 streams totaling 2,852 miles are affected by mine drainage. Approximately 1,900 of these stream miles are affected by low pH. Abandoned mine drainage is undoubtedly the most serious water quality problem facing the State.

West Virginia realizes the solution to this problem is both complex and extremely costly. Unfortunately, the state cannot single-handedly address this problem due to the magnitude of the reclamation costs involved. It will take the combined efforts of agencies such as DEP, the federal Office of Surface Mining (OSM), and U. S. EPA in order to repair the ecological damage caused by abandoned coal mines.

Significant progress in cleaning up AMD has been made with the initiation of the governor's Stream Restoration Program in 1992. This program targets funds for limestone treatment of AMD impacted streams. This effort, funded primarily by the state's Abandoned Mine Lands (AML) program, has already lead to significant improvements in water quality in streams such as the Middle Fork and Blackwater rivers. Many other streams have been targeted for restoration via this innovative program.

B. Lack of Domestic Sewage Treatment

The majority of the state has progressed in the construction of sewage treatment plants with the aid of the Construction Assistance Program. However, the southwest portion of the state, (mainly the Guyandotte and Big Sandy/Tug Fork basins), is significantly lacking adequate sewage treatment facilities, and therefore suffers major stream impairment. These impacts are especially evident in many small streams that have very little waste assimilative capacity.

The Office's Guyandotte River Basin Plan (1987) found that 86 (20 percent) of the streams surveyed were in violation of the state water quality standard for fecal coliform. This problem is of even greater magnitude in the Big Sandy/Tug Fork Basin, as 77 (35 percent) of the streams surveyed in 1986 were reported in violation of the fecal coliform standard. This data is corroborated by the ambient water quality data collected by the Office during this reporting period. The Guyandotte River at Huntington violated the fecal coliform standard in 83 percent of the samples collected. Likewise, the Tug Fork River at Fort Gay displayed a 75 percent violation frequency. In both of these basins, the primary source of the problem is the direct discharge of untreated domestic sewage into the streams. The improper disposal of domestic sewage also is evident in other river basins in the state. One alarming example is presented in the ambient monitoring data from the West Fork River at Enterprise, which displayed fecal coliform violations in 96 percent (23 of 24) of the samples taken during this reporting period. Other ambient network streams with fecal coliform violations occurring on a regular basis (i.e., > 20 percent) include the Tygart Valley River above Beverly (48 percent), Coal River at Tornado (46 percent), Monongahela River below Morgantown (39 percent), and Kanawha River at Winfield Locks and Dam (38 percent).

In addition to the above streams, several tributaries of the New River within the boundaries of the New River Gorge National River were found to regularly violate the state fecal coliform standard. Sewage from these areas also is apparently having an impact on water quality in the New River mainstem, as several mainstem sites were found to have frequent fecal coliform violations.

This sewage contamination is expected to continue due to the depressed economy in certain counties of the state. The problem also will be compounded due to the discontinuation of EPA's grants program for sewage treatment facilities. In an effort to make money available for such construction, the state has developed a revolving loan program to provide assistance for the construction of sewage treatment facilities. This loan program is administered by the Office's Construction Assistance Branch. It is essential that the state appropriate the annual matching funds necessary for the operation of this low or zero interest loan program. Such funds were not appropriated during the 1990 legislative session. An appropriation was made during the 1991 session, although the amount fell short of the intended goal.

C. Funding for Laboratories

Much of the assessment information included in the 305(b) report is dependent upon accurate laboratory analysis of water samples. Many of the programs outlined in the Water Quality Act of 1987 (e.g., clean lakes, nonpoint assessment, clean water strategy, toxics) require states to generate additional monitoring data. Adequate capability to analyze water samples is crucial to the success of any monitoring program.

The Office's current laboratory facilities are in critical need of funding. EPA is well aware of the inability of the Office's laboratory to meet the current needs of the various water pollution control programs.

EPA should consider providing laboratory and quality assurance support through the various programs it funds. For example, laboratory support funds could be provided through programs such as RCRA, LUST, CERCLA (Superfund), UST, NPDES, UIC, and others. All of these EPA programs need laboratory support, however such funding is not specifically provided.

D. Lack of Land Use Policies

Most counties in West Virginia have no formal plans that address the accommodation of future development. The lack of such planning is of particular concern in the state's eastern panhandle (Potomac River drainage). Several counties in this area are experiencing rapid growth as a result of "urban sprawl" from the Washington, D.C. area. During development of an area, consideration must be given not only to the proper treatment of municipal and industrial wastes, but also to the waste assimilative capacities of receiving waters. Development of areas in small watersheds, therefore, must be given additional consideration due to the low assimilative capacities of these streams. Over-development, if allowed, can obviously create severe water quality problems. Potential groundwater contamination also must be considered, particularly in areas of karst geology present in this part of the state.

The Office of Water Resources is continually confronted with questions regarding land use in the issuance of permits. Therefore, the Office is of the opinion that the creation of a planning strategy for the development of these areas should be highly prioritized by local and/or county governments in order to assure the maintenance of high quality water.

E. Sludge Management

Sludge management and disposal from municipal facilities is currently addressed by the Office of Water Resources sludge management program. Municipal facilities with approved sludge management programs receive authorization to dispose of sludges through transport to permitted landfills, incineration at permitted facilities, or land application. Of the approximately 135 facilities that have sludge disposal needs, 120 have received approval under the program. Language in the NPDES permit requires the permittee to use sludge disposal methods approved by the Office Chief. Those facilities currently operating without an approved sludge management program will be addressed under the administrative procedures provided in the NPDES program.

Municipal facilities approved for land application are providing a beneficial resource to the landowners who choose to accept the material and use it according to established guidelines. Sewage sludge is a great additive for soils and provides a source of nutrients for the crops that grow on them. Sludge applied to fields can provide a portion of the nitrogen and phosphate that crops and forages need. Because sludge is primarily organic matter, sludge additions improve the soil's aeration, fertility, and water-holding capacity. Research has shown that sludge is actually better than commercial fertilizer for increasing crop yields.

The Office of Water Resources will continue to promote this disposal option as an environmentally acceptable method, in addition to providing a low cost alternative to soil additives and fertilizers.

F. Licensing of Hydropower Projects

The Federal Energy Regulatory Commission (FERC) issued licenses for 16 hydroelectric projects on the Monongahela, Allegheny, and Ohio rivers on September 27, 1989. The Order issuing the licenses was the outcome of the FERC Environmental Impact Statement (EIS), FERC Docket No. EL85-19-114.

The State natural resources agencies in West Virginia, Ohio and Pennsylvania, the U. S. Fish and Wildlife Service, U. S. Environmental Protection Agency, Ohio River Valley Water Sanitation Commission, as well as others, provided on-going comments and recommendations during the EIS proceedings, including the initial scoping sessions. The draft and final EIS were released for review in May and October of 1988, respectively. The West Virginia Division of Natural Resources (WVDNR) subsequently responded to each with filings of lengthy comments/recommendations regarding fish, wildlife and recreational impacts as well as objections related to water quality. Additional recommendations and or responses regarding water quality and/or fish and wildlife issues were submitted to FERC on three separate occasions (January, May, and August) in 1989. While some fishery recommendations were accepted, in each instance FERC failed to adopt an approach that would address all of the outstanding concerns and comply with applicable State law (i.e., at a minimum, water quality standards and state certification regulations).

As a result of the FERC licensing action of September 27, 1989, which failed to include WVDNR recommendations, a formal petition was filed with FERC on October 27, 1989, requesting a rehearing of the licensing action. Further, WVDNR filed a similar rehearing petition for each of the eight projects located within the State's border. In addition to the rehearing request, WVDNR asked for a stay of the licenses until such time that the rehearing and other outstanding issues are resolved.

FERC reviewed and denied the request for rehearing of the licenses on June 5, 1990. In August 1990, the states of West Virginia and Pennsylvania, the U.S. Department of Interior, American Rivers, and Friends of the Earth subsequently filed petitions with the U.S. Court of Appeals for the District of Columbia requesting review of the FERC Order. As of the end of this reporting period, federal court action was pending.

Should the petitions not result in amendment of the present licenses, the following are potential consequences of the development and operation of the hydropower projects:

1. Reduction of dissolved oxygen concentrations throughout the Upper Ohio River Basin.
2. Violation of West Virginia's Anti-degradation Policy requiring the maintenance of existing DO (dissolved oxygen) concentrations.
3. Limitation or decline in the attainment of National Water Quality Goal Uses including:
   a. Public Water Supply
   b. Water Contact Recreation
   c. Propagation and Maintenance of Fish and Aquatic Life
4. Reduction in wasteload assimilative capabilities of the Ohio and Monongahela rivers in West Virginia.
5. Revision of present municipal and industrial wasteload allocations in river reaches where an allocation would result in a violation of the State and EPA mandated water quality standard of 5.0 mg/L for DO.
6. Denial of NPDES permits requiring wasteload allocations in river reaches where an allocation would result in a violation of the State and EPA mandated water quality standard for DO.
7. Limitation of future economic and industrial development in the Upper Ohio River Basin.

G. Monitoring Programs

Many of the Section's water quality monitoring programs have had to be scaled back due to insufficient funds and/or shortages in manpower. For example, the state routinely monitors only 27 sites as part of its ambient chemical monitoring network. This provides very limited coverage on a statewide basis, considering there are more than 9,000 streams in West Virginia totalling over 32,000 miles. Stream and groundwater monitoring are crucial for gaging the effectiveness of the state's water pollution control programs. The importance of an adequate monitoring program cannot be overemphasized.

H. Agricultural Development in Karst Regions

Agricultural development, particularly poultry farming, has increased dramatically in the state over the past few years. This development presents special problems in regions of the state characterized by karst geology, such as the Potomac and Greenbrier River valleys. Potential problems that may stem from unchecked agricultural development are nutrient and bacterial contamination of both surface and groundwater.

Recommendations

Following is a list of recommendations concerning water quality issues of great importance to the state.

A. Nonpoint Sources

Nonpoint source pollution is a major problem affecting the state's waters. The extent and impact of this type of pollution has been documented in numerous water quality reports. EPA has responded to the nonpoint source problem through Section 319 of the CWA, as amended. This was an important step in addressing the nonpoint source pollution problem. EPA, along with other federal, state, and local agencies should continue its interest and involvement in the nonpoint program.

The governor's Stream Restoration Program should be expanded and funds made available for treatment of additional AMD impacted streams. Other important NPS problems that will require a concerted effort to address are erosion and sedimentation and agricultural runoff. The state Nonpoint Source Assessment (August, 1989) may be referenced for specific concerns.

A statewide erosion and sediment control law would be very beneficial in helping to control siltation, perhaps the most pervasive of all water quality problems. Agricultural pollution is a serious threat to water quality in certain areas of the state, particularly the Potomac and Greenbrier River valleys. The burgeoning poultry industry in the eastern panhandle threatens both water quality and quantity in that area. Agricultural impacts should be addressed through NPS programs covered by the various state and federal agricultural and soil conservation agencies.

B. Boundary Waters

Boundary or interstate waters present difficult and somewhat unique problems for permit writers to address. Waters that form territorial boundaries between states obviously have the potential to receive waste water from both states. This is especially true for larger, more industrialized waters such as the Ohio River.

In West Virginia, permit allocations for the total daily load from a facility are based on a seven-day low flow, 10 year return frequency (7/Q/10) situation. Other states may also use this flow regime as a basis for issuing permits. In deriving wasteload allocations for these waters, discharge information from adjoining states apparently is not used or is not available for consideration. This presents the possibility of over-allocating some wastes for the receiving stream. Such is the case with the Ohio River in West Virginia. The Ohio is a major stream which displays levels of concern for various toxic and conventional pollutants. Second round WV/NPDES permits have, for the most part, been issued with Best Available Technology/Best Professional Judgement (BAT/BPJ) controls. Wasteload allocations utilizing TMDL's (total maximum daily load) have not been developed for any of West Virginia's waters. While existing permitting practices adequately address wasteloads for waters totally within state boundaries, concern does exist for border waters possibly receiving excessive amounts of pollutants due to an adjacent state's independent permitting actions.

This is a problem which cannot be solved at the state level. EPA must take the lead in resolving interstate concerns about border waters in order to meet wasteload allocations for these waters and to ensure that states do not work independently on permit issuance. EPA is encouraged to utilize existing interstate agencies or commissions, such as ORSANCO for the Ohio River, to facilitate this need.

C. Establishment of Human Health Risk Criteria

The need to establish human health risk criteria for substances known to pose a human health threat, and guidance for criteria use in water quality management, is imperative. The establishment of these criteria and guidance cannot be achieved at the state level. As an example, an effort to establish a policy for risk assessment guidance for fish consumption was made by ORSANCO and its member states during the 1990 reporting cycle. Unfortunately, this policy development proved unsuccessful. In establishing these criteria, consideration must be given to situations such as interstate waters (discussed above) and multi-media (air and water) exposure for some compounds.

West Virginia utilizes risk criteria at the 10 to the minus 6 (1 in 1 million) level in developing discharge limitations for suspected and/or known human carcinogens based on a seven-day, 10 year return frequency low flow (7/Q/10) event.

The need to emphasize the utilization of risk-related criteria among states appears obvious. Therefore, EPA, FDA (Food and Drug Administration) and other federal agencies should not only take the responsibility of establishing these criteria on a national or regional level, but also ensure their implementation.

D. Watersheds Impacted by Mining

In the 1988 305(b) report, a recommendation concerning the protection of fragile watersheds was made. Special concern was expressed for the Stony and Buckhannon River watersheds. During the current reporting period, water quality monitoring by DEP on Stony River indicates that impacts from both active and abandoned mining activity continues. Acidic discharges in the watershed above the Mt. Storm dam are mitigated by highly alkaline process water from West Virginia Power Company's coal-fired power plant. DEP permits the alkaline discharge for the express purpose of buffering the water in Mt. Storm reservoir. Abandoned mine discharges on Fourmile Run have killed that tributary, which, in turn, negatively impacts Stony River. Alkaline discharges from Island Creek Coal Corporation's Laurel Run Mine may mitigate the chemical effects of the abandoned discharges slightly, but Fourmile Run is still biologically dead. In addition, concern exists that an active refuse dump may be leaking contaminated water into Fourmile Run.

The Buckhannon River and its tributaries also have been severely impacted by mining activities. Both the Buckhannon and Stony river watersheds are characterized by coal seams associated with geologic strata that are acidic and laden with heavy metals. Based on the water quality impacts and frequent fish kills experienced, it is obvious that proper control of mine drainage is difficult to achieve in these areas, even with best available technology. Therefore, it is recommended that these watersheds, along with others of similar geology, be given special attention with respect to potential mining impacts. This action would not only alleviate some immediate concerns, but also would help assure that West Virginia's existing water quality problems associated with mine drainage will not be compounded in the future.

Data from the Ambient Water Quality Monitoring Mini-network collected in 1989-90 indicate that Big Clear Creek and Little Clear Creek are negatively impacted by mining in their respective watersheds. Active mining activities are contributing to their degradation and abandoned mine drainage may also be a contributor. One water sample from Big Clear Creek exhibited a violation of the unionized ammonia standard for troutwater. Several violations of various metals standards were detected in both streams. There is a great deal of concern that continued water quality violations of this magnitude will render the two streams unsuitable as trout fisheries.

The 1989-90 Mini-network data indicates that streams located in the Monongahela drainage basin may be particularly susceptible to the degrading effects of mineral extraction activities and acidic precipitation. The poor buffering capacities of Whiteday Creek, Laurel Creek (near Arden, Barbour County) and Teter Creek are likely representative of other small streams in the area. Several tributaries of New River in the vicinity of New River Gorge National River also have low buffering capability. A nationwide attempt at decreasing the sources of acidic deposition and attempts at the state level to prevent destructive mineral extraction practices and those practices that result in the need for perpetual mine water treatment will be necessary to protect such streams.

E. Water Quality Monitoring

Development of a statewide monitoring strategy should be a priority for the following programs: Permitting, Nonpoint Source, Clean Lakes, Groundwater, Ambient and Mini-ambient, and Biology. Increased funding is needed so that the state can adequately monitor and assess its surface and groundwater resources.

F. Lake Management and Protection

Lake management and protection efforts are important to the state's citizens and should receive continued state and federal support. The state Clean Lakes Program can be enhanced by the following activities: 1) establishment of a technical assistance program to benefit lake owners such as watershed associations and municipalities; 2) development of specific lake water quality criteria; and 3) creation of an information and education program on lakes and watersheds.

G. Citizen Monitoring

Volunteer water quality monitoring has become a very popular activity in West Virginia and has been an important tool for increasing the environmental awareness of the state's citizens. This activity needs to receive the continued logistical and financial support from both EPA and the state, as such support is critical to the program's success.

STATEMENT OF POLICY REGARDING THE EQUAL OPPORTUNITY TO USE AND PARTICIPATE IN PROGRAMS

It is the policy of the West Virginia Division of Environmental Protection to provide its facilities, accommodations, services, and programs to all persons without regard to sex, race, color, age, religion, national origin, or handicap. Proper licenses/registration and compliance with official rules and regulations are the only sources of restrictions for facility use or program participation. Complaints should be directed to: Director, WV Division of Environmental Protection, 10 McJunkin Road, Nitro, West Virginia, 25143-2506.

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