West Virginia
Water Quality Status Assessment
1989 -1991
305(b) Report

Gaston Caperton
Governor

West Virginia Division of Environmental Protection

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PART I: EXECUTIVE SUMMARY/OVERVIEW

This report has been prepared to meet the requirements of section 305(b) of the Clean Water Act. It is compiled from data collected by a number of State, interstate and federal agencies, including the WV Division of Natural Resources, WV Division of Energy, WV Department of Health, Ohio River Valley Water Sanitation Commission (ORSANCO), U.S. Geological Survey (USGS), U.S. Forest Service (USFS), and U.S. Army Corps of Engineers. It provides a general assessment of the quality of the State's surface and ground water resources. The report addresses public health/aquatic life concerns and provides updated assessments on the State'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, it provides a list of recommendations for the improvement of water quality management in the State.

There are over 9,000 streams in West Virginia, comprising a total length of more than 32,000 miles. 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 the approximately 32,000 stream miles in the state, 5286 miles (approximately 16%) were assessed for attainment of Clean Water Act goals using information and data from various sources. These sources include State Biologists and Water Resources Inspectors, on-going monitoring data, stream surveys, basin plan information, and citizen collected data. Some of this information is subjective in nature, however professional judgement is a valid and acceptable means of assessing a waterbody, provided that the level of confidence in making the judgement is high.

The 5286 total stream miles assessed in this report is significantly lower than the number of miles assessed in the 1990 report. This is primarily due to the fact that data taken from State River Basin Plans for use in the 1990 report were considered too outdated for use in the 1992 report. The majority of data used in the 1992 report is less than five years old.

Of the stream miles assessed during this report period, 14% (713 miles) fully supported their designated uses, 7% (367 miles) were fully supporting but threatened, 63% (3347 miles) were partially supporting, and 16% (857 miles) were not supporting. About 84% (26,991 miles) of the State's streams were not assessed. It is important to realize that many of the streams selected for monitoring during this report period were sampled because of known or suspected pollution problems. Thus, sampling of streams in West Virginia is generally not performed in random fashion. Due to this fact, it is perhaps 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 were also evaluated in accordance with section 314 of the Act. Of the 21,522 acres assessed, 27% (5732 acres) fully supported designated uses, 8% (1775 acres) were fully supporting but threatened, 57% (12,285 acres) were partially supporting, and 8% (1730 acres) were non-supporting. All 93 of the State's public lakes were evaluated during this report period.

The major causes of impairment to streams and lakes were identified as siltation, metals, pH, and nutrients. The major sources of impairment were identified as coal mining, construction activities, agriculture, and domestic sewage. A breakdown of the the various causes and sources of pollution impacts to streams and lakes is contained in this report.

Of the 5286 stream miles assessed during this report period, 2168 (41%) were monitored for toxics. Of the 2168 stream miles monitored for toxics, 1895 (87%) were found to contain elevated levels. Although the majority of stream miles monitored for toxics contained elevated levels, it is significant 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 during this report period, 16,186 (78%) were monitored for toxics. Of the 16,186 lake acres monitored for toxics, 8464 (52%) were found to contain elevated levels. The lakes found to contain elevated levels of toxics were limited to a few of the large Army Corps of Engineers Reservoirs which had elevated levels of heavy metals in the hypolimnion (i.e. bottom waters). No toxic metals were detected 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 rather common phenomenon. Various tables which relate toxic impacts to public health and aquatic life are contained in this report.

West Virginia's wetlands (102,000 acres) comprise less than one percent of the State's total acreage. The State takes great interest in the management of these areas. Such management efforts are mainly geared toward protection of wetlands either by regulatory procedings or acquisition. West Virginia has an active 401 certification program under the regulatory process, however permitting authority for activities impacting wetlands (404) lies with the U.S. Army Corps of Engineers. West Virginia's wetlands management and regulatory process are administered through DNR's Wildlife Resources Section and Office of Environmental and Regulatory Affairs. In August 1992, the newly formed Division of Environmental Protection 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.

Ground water in West Virginia is, on the average, both abundant and of adequate quality. This is true largely due to the rural nature of West Virginia. Ground water quality in developed/industrialized/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 priceless ground water resources. The legislation provides authority to collect fees for program operations and remediation efforts, grants authority to the Water Resources Board to set ground water quality standards, and allows

for the creation of ground water 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 primaril achieved through the 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 also encompasses facility inspections, complaint investigations, compliance monitoring, biological monitoring and chemical monitoring. Inspections of the various activities covered under the nonpoint control program are also performed and are intended to aid in the reduction of this source of pollution. The vast majority of these inspection activities have been directed toward silviculture and construction activities. West Virginia's surface water monitoring program is comprised of compliance inspections, intensive biological and/or chemical surveys on a site-specific basis, ambient chemical and biological monitoring, citizens monitoring, special surveys and investigations, and the utilization of benthic and toxicity data to assess environmental perturbations. An increase in site-specific fish tissue evaluation has occurred during this reporting period in order to respond to human health concerns through the development of fish consumption advisories where necessary. 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 unsewered. The result is the improper disposal of domestic sewage into the surface and groundwater.
- Funding for laboratories - The Division's laboratory is currently not able to meet the analytical needs of the numerous water quality related programs as a result of inadequate funding.
- Lack of land use policies - Development of areas in small watersheds must be carefully controlled in order to assure the receiving waters are capable of assimilating any wastewater resulting from such development.
- Unpermitted wood treatment plants - The Division is concerned about the current or potential impact these facilities have on both surface and groundwater due to the nature of the highly toxic chemicals employed in the wood treatment process.
- 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. The State is currently only able to monitor a very small percentage of its total stream miles.

Agricultural develpment in Karst regions - Agricultural development has increased dramatically in certain parts of the State over the past few years. This presents special problems in areas characterized by Karst geology, such as the Potomac and Greenbrier River valleys. Potential problems 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 which are characterized by coal seams associated with geologic strata which are acidic and laden with metals and other pollutants.

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 ground water 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 environmental awareness of the public. This activity needs tp have the continued logistical and financial support from both EPA and the State.

Background

Part II: BACKGROUND

The West Virginia Division of Environmental Protection (DEP) has prepared this report in accordance with Section 305(b) of the Clean Water Act (PL 92-500, as amended). Preparation of this report is currently the responsibility of the DEP's Office of Water Resources. On July 1, 1992 by executive order of the governor, the Office of Water Resources was transferred from the Division of Natural Resources (DNR) to the Division of Environmental Protection. With the transfer, however, the agency's primary mission of protecting the State's surface and groundwater resources remains essentially unchanged. Since the report period for this assessment (July 1989-June 1991) covers a period of time prior to the establishment of DEP, the Office of Water Resources hereafter will be referred to by its former designation as the Water Resources Section of DNR.

This report provides a general assessment of water quality conditions of West Virginia's ground water, lakes, and streams other than the mainstem Ohio River. The assessment of the Ohio River mainstem is provided in the Ohio River Valley Water Sanitation Commission's (ORSANCO) report (Appendix A).

The majority of this assessment of West Virginia's surface and ground water quality is developed from information collected during the period July 1989 through June 1991. The assessment is based upon current data obtained from monitoring stations maintained by DNR's Water Resources Section, State Department of 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, State Division of Energy, DNR's Wildlife Resources Section, and the State sponsored Save Our Streams citizen monitoring program. A portion of the information contained in the previous 305(b) report was obtained from State Water Resources Inspectors and Biologists. Some of this information has also been used to supplement this report. Additionally, a small amount of water quality information contained in the State's previously published basin plans has been utilized in this report.

This assessment does have limitations which must be taken into consideration when interpreting the sampling data used to derive water quality status for basins, subbasins 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 over 9,000 streams, totaling more than 32,000 miles in West Virginia. The majority of these were not sampled during this report 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 River and Tug Fork with 128 border miles, the Ohio River with 277 border miles, and the North Branch of the Potomac and Potomac rivers with 214 border miles. Collectively, the State river basins contain over 9,200 streams totaling some 32,278 miles.

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

The most recent inventory of freshwater wetlands (WV DNR, 1987) indicates that there are 102,000 acres of various types of wetlands existing 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% forest, 12% agriculture, 6% developed (industrial, commercial, urban, roads, etc.), 2% mining and 1% wetlands.

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

Because of the regionalized steeply dissected topography and unfavorable soils; mining, oil and gas exploration, and timbering operations are also of major concern, due to nonpoint pollutant contributions to many streams. These problems are particularly acute in the Big Sandy/Tug Fork, Guyandotte, Coal, Kanawha, Elk, Pocatalico, and Little Kanawha watersheds.

Agricultural waste handling and runoff are of concern mainly in the Potomac watershed, particularly the extreme eastern portion due primarily to the large amount of agricultural operations and the area's limestone geology. Agricultural activities are also 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 those areas of the state where industry has in the past tended to concentrate. These areas include 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. Most others are small streams having acceptable to excellent water quality. Unfortunately, some of these are the same class of streams that receive treated and/or abandoned mine waste, treated or untreated sewage; 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. The cumulative effect of these smaller streams, when they are impacted by pollution sources, does not manifest itself in the larger receiving streams in the form of impacted or loss of uses. This is not true though for the small streams themselves. Their uses are often 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 are supporting their designated uses, there are a number of small streams and segments of small streams that are degraded and do not support their uses. A more comprehensive determination of the status of these small streams can be found in other Division of Water Resources 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 assesment (August, 1989) may also be referenced for such information.

The State's geology and resulting topography limit the number and extent of wetlands. With only 159 square miles (0.65% of the state's total surface area) comprised of wetlands, it is obvious why West Virginia is very active in the protection of its 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 CSR 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 Propogation 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

Table II-1. Water Resources Atlas

State population (1990)	1,793,477
State surface area	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 costal miles	0
Number of Great Lakes shore miles	0
Acres of freshwater wetlands	102,000
Acres of tidal wetlands	0

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 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.

Category B - Propogation 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, etc.

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. (See Appendix C for representative list.)

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 (1990) 305(b) report.

Surface Water Assessment

PART III: SURFACE WATER ASSESSMENT

Chapter One: Summary Data

Methodology

Use support of the State's waters were determined by using criteria established by EPA within the 305(b) guidelines (August, 1991). Waters are classified as fully, partially or not supporting. Fully supporting waters are those which do not exceed criteria in greater than 10% of measurements or do not have any pollution sources present that could interfere with the use. Partially supporting waters are those which exceed criteria in 11-25% of measurements, or that have pollution sources present which result in only partial attainment of the use. Waters classified as not supporting exceed criteria in greater than 25% of measurements, or have a magnitude of pollution sources likely to impair the use or exceed criteria. Biological information was also used to aid 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 greater 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 these instances.

The achievement of recreational use goals of the CWA is primarily based on the actual utilization of water contact recreation, with consideration given to fecal coliform bacteria and/or waterborne diseases. The State Health Department has restricted recreational use in the past due to such reasons. However, no closures were reported by the Health Department during this report 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 was also 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.

The 305(b) guidelines permit use support to be determined on the basis of either evaluated or monitored assessments. A number of evaluated assessments on streams have been carried over from the previous (1990) 305(b) report and are based on the professional judgement of Water Resources Inspectors and Biologists throughout the state. While this type of assessment is subjective, it does reflect the employee's knowledge of stream conditions in his/her assigned geographical area of the State.

Unfortunately, these assessments were not able to be updated due to a shortage of personnel. However, some of these evaluations are still considered valid and have therefore been utilized in this report. Other evaluated assessments are based on the chemical and biological data presented in the Division's river basin plans. However, since many of these basin plans are

greater than five years old, only a limited amount of data was considered valid for current usage.

Although evaluated assessments may not have any recently associated monitoring data for support, they are still considered an accurate, valid, and valuable tool for use in stream characterization. For example, should an Inspector or Biologist encounter a stream in which the substrate is laden with silt, or the actual water column displays turbidity, it is obvious the stream is being impacted by sedimentation. Likewise, if a waterbody displays an orange-red colored precipitant on the substrate, the Inspector or Biologist knows the stream is being impacted by metals (iron in this case). In most cases, the source of such pollution would also be determined.

Monitored assessments are based on existing current biological and/or chemical data. These data include ambient water quality data from various agencies, fishery surveys, benthic surveys, mussel surveys, and monitoring reports. Water quality monitoring information from the Section's mini-network and New River cooperative monitoring project were also utilized in this report. Determining whether a stream or segment supports or partially supports a designated use involves more than an evaluation of objective data. As previously stated, the determination is based on interviews with staff in the Division of Natural Resources, including District Fishery Biologists, Aquatic Biologists, permits personnel and Water Resources Inspectors in combination with objective data. For instance, a stream may have fish in it and there may be an active sport fishery. But then the question was asked, "could it be significantly better?" If the answer was yes and the limiting factor was a man-made pollution source, the segment was listed as partially supporting.

Water Quality Summary

The evaluated and monitored assessments resulted in a total of 5,287 miles of rivers and streams being assessed for designated uses. This is 16.4% of the State's total stream mileage. Of the total stream miles assessed, 16% did not support the designated uses, 63% were partially supporting, 14% were fully supporting, and 7% were fully supporting but threatened. 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, 11% were not supporting, 63% were partially supporting, 19% were fully supporting, and 7% were fully supporting but threatened. Of the total stream miles assessed for Fish Consumption Use, 59% were not supporting, 17% were partially supporting, and 24% were fully 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

TABLE III-1

OVERALL DESIGNATED USE SUPPORT SUMMARY

WATERBODY TYPE: RIVERS

TOTAL NUMBER OF ASSESSED RIVERS: 324

TOTAL NUMBER OF MONITORED RIVERS: 229

TOTAL NUMBER OF EVALUATED RIVERS: 94

(all size units in Miles)

DEGREE OF USE SUPPORT	EVALUATED	MONITORED	TOTAL
FULLY SUPPORTING	126.19	587.41	713.60
SUPPORTING BUT THREATENED	43.76	323.80	367.56
PARTIALLY SUPPORTING	248.11	3099.69	3347.80
NOT SUPPORTING	280.36	577.29	857.65
NOT ATTAINABLE	0.00	0.00	0.00
TOTAL SIZE ASSESSED	698.42	4588.19	5286.61
NOT ASSESSED	----	----	26991.39

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
OVERALL USE SUPPORT	714.25	367.56	3347.80	857.65
AQUATIC LIFE SUPPORT	1006.74	367.56	3323.44	591.76
FISH CONSUMPTION	154.95	0.00	109.61	388.95
COLD WATER FISHERY (TROUT)	331.27	158.41	299.46	201.09
WARM WATER FISHERY	634.44	236.49	3039.38	224.11
CONTACT RECREATION	568.44	0.00	866.00	38.00
SWIMMABLE	3387.04	124.38	1163.23	463.34
SECONDARY CONTACT RECREATION	3.60	0.00	37.50	0.00
DRINKING WATER SUPPLY	1842.07	0.00	330.00	236.52
INDUSTRIAL USE	617.00	0.00	0.00	0.00
BAIT MINNOW FISHERY	851.64	252.12	1514.54	331.98

design, the results will more often than not indicate an impaired stream condition.

The swimmable goal of the Clean Water Act, like the fishable goal, is also assessed in two parts: Swimmable Use and Secondary Contact Recreation Use. Of the total stream miles assessed for the Swimmable Use, 9% were not supporting, 23% were partially supporting, 66% were fully supporting, and 2% were fully supporting but threatened. Of the total stream miles assessed for the Secondary Contact Recreation Use (i.e., boating, fishing, or any activity where water contact is incidental), 91% were fully supporting and 9% were partially supporting. The preceding figures for Secondary Contact Use may not be very representative of general stream conditions, since very few streams are assessed on an annual basis for this use.

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 subbasin is assigned a capital letter(s). 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 are also 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
" "	"	05070102
Mud River	OGM	05070102-020
Clear Fork	OGC	05070101-040

Kanawha River	K	05050006
" "	"	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
" "	"	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 which do not fully support designated uses is summarized in the following sections, while such 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 streams are pH (728 miles), metals (554 miles), and siltation (543 miles). These three parameters have also had a significant historical impact on State streams. Additionally, priority organics (377 miles), nutrients (302 miles), and pesticides (277 miles) pose a major threat to the State's waters.

The chief causes of moderate/minor impacts to State streams are siltation (2880 miles), fecal coliform (2147 miles), and metals (1925 miles). Additionally, pH (1153 miles), turbidity (777 miles), nutrients (494 miles), and organic enrichment (398 miles) pose moderate/minor threats to State streams. A detailed summary of the various pollution causes is provided in Table III-3.

Relative Assessment of Sources

The principal sources of major impacts to West Virginia streams include coal mining (741 miles), industrial point sources (358 miles), pasture land (259 miles), and petroleum activities (256 miles). Additional sources of major impacts to streams are general agriculture (256 miles), nonirrigated crop production (246 miles), and domestic sewage (156 miles).

The largest sources of moderate/minor impacts to State streams are coal mining (2673 miles), municipal point sources (1211 miles), pasture land (1203 miles), and road construction (1170 miles). Additional sources of moderate/minor impacts are combined sewer overflows (806 miles), general agriculture (691 miles), domestic sewage (591 miles), and petroleum activities (489 miles). Detailed in formation on the various pollution source categories is provided in Table . 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 is worthy of special recognition.

Chapter Two: Public Health/ Aquatic Life Concerns

Size of Waters Affected by Toxics

In general, only a small percentage of the State's waters are monitored for toxics in any given year, primarily due to the inherent 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 to be 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 in great 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.

In previous 305(b) reports, West Virginia chose to include conventional, "non-priority" pollutants in its toxic assessment

Table III-3

305(b) Relative Assessment of Causes
03-25-93

Query condition: (WBTYPE = 'R' AND ASDATE = 9112) AND (WBSEGNO = '00')

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	1.61	0.00
Unknown toxicity	1.60	0.00
Pesticides	277.00	0.00
Priority organics	377.50	18.78
Nonpriority organics	4.85	18.78
Metals	554.51	1925.36
Unionized Ammonia	9.60	18.04
Chlorine	22.57	0.00
Other inorganics	82.45	4.00
Nutrients	302.35	494.35
pH	728.98	1153.65
Siltation	543.44	2880.25
Organic enrichment/DO	148.62	398.69
Salinity/TDS/chlorides	0.00	49.11
Thermal modifications	4.85	27.27
Flow alteration	24.30	18.78
Other habitat alterations	0.75	62.34
Pathogens	0.00	70.00
Radiation	0.00	0.00
Oil and grease	28.86	0.00
Taste and odor	0.00	0.00
Suspended solids	0.00	18.90
Noxious aquatic plants	0.00	116.00
Filling and draining	0.00	66.90
Total toxics	38.90	0.00
Turbidity	160.00	777.00
Exotic species	0.00	0.00
Discoloration	0.00	4.15
Sludge deposits	0.00	10.35
Odor	0.00	0.00
Fecal coliform	190.52	2147.23

Table III-4

305(b) Relative Assessment of Sources
03-25-93

Query condition: (WBTYPE = 'R' AND ASDATE = 9112) AND (WBSEGNO = '00')

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	358.63	449.37
Municipal Point Sources	129.02	1211.92
Combined Sewer Overflow	36.15	806.28
Agriculture	256.76	691.69
Nonirrigated crop production	246.53	502.49
Irrigated crop production	0.00	0.00
Specialty crop production	0.00	0.00
Pasture land	259.38	1203.37
Range land	0.00	0.00
Feedlots - all types	0.00	0.00
Aquaculture	0.00	4.73
Animal holding/management areas	28.20	690.67
Manure lagoons	0.00	0.00
Silviculture	128.76	261.68
Harvesting,restoration,residue managemt	0.00	0.00
Forest management	0.00	0.00
Road construction/maintenance	238.70	1170.21
Construction	68.99	60.72
Highway/road/bridge	0.00	23.90
Land development	132.00	154.86
Urban runoff/Storm sewers	122.12	337.51
Coal mining	741.99	2673.91
Surface Mining	0.00	0.00
Subsurface mining	0.00	9.25
Placer mining	0.00	0.00
Dredge mining	0.00	0.00
Petroleum activities	256.44	489.60
Mill tailings	0.00	0.00
Mine tailings	166.84	419.60
Land disposal	32.42	18.78
Sludge	0.00	0.00
Wastewater	0.00	0.00
Landfills	3.16	4.14
Industrial land treatment	0.00	1.75
Onsite wastewater systems (septic tanks)	109.15	228.45
Hazardous waste	0.00	0.00
Septage disposal	0.00	0.00
Hydromodification	13.87	19.94
Channelization	1.00	18.90
Dredging	0.75	0.00
Dam construction	0.00	0.00
Flow regulation/modification	0.00	0.00

Table III-4 continued
305(b) Relative Assessment of Sources
03-25-93

Query condition: (WBTYPE = 'R' AND ASDATE = 9112) AND (WBSEGNO = '00')

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
Bridge construction	0.00	0.00
Removal of riparian vegetation	0.00	51.20
Streambank modification/destabilization	55.18	167.76
Drainage/filling of wetlands	0.00	5.00
Other	16.68	0.00
Domestic sewage	156.96	591.42
Atmospheric deposition	136.38	385.80
Waste storage/storage tank leaks	0.00	1.75
Highway maintenance and runoff	0.00	163.26
Spills	0.00	277.00
In-place contaminants	19.45	0.00
Natural	120.00	161.80
Recreational activities	0.00	0.00
Upstream impoundment	0.50	0.00
Salt storage sites	0.00	0.00
Source unknown	328.61	224.83

for several reasons. First of all, all metals, not just those on the priority pollutant list, are known to induce toxic effects on aquatic life, particularly cold-water (trout) fisheries. Second, the toxic effects of metals and acidic water, mainly from abandoned coal mines, is most evident. Third, streams impacted by such pollutants are incapable of supporting any type of aquatic life, and were therefore interpreted as being affected by toxics. Such an interpretation in its 1988 305(b) report resulted in West Virginia possessing the largest total mileage of toxic-impacted waters of any state in the nation. Due do the probability of being misrepresented, the State no longer interprets toxic impairment as loosely as it has in the past. West Virginia's assessment of toxics should now be more consistent with other states (i.e., based on priority pollutant data only).

Virtually all toxic pollutants included in the State water quality criteria established by the Water Resources Board are monitored by some means. Such monitoring methods include analyzing the water column through ambient networks maintained by the Water Resources Section, ORSANCO, U.S. Army Corps of Engineers, etc. Toxics monitoring is also performed through the Section's compliance sampling and toxicity testing programs. A self-monitoring program is also administered by way of the Section's NPDES permitting system. This self-monitoring program requires permittees to submit water quality information, including toxics, to the Section on a 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	Chlordane
Antimony	DDT
Arsenic	Aldrin-Dieldrin
Barium	Endrin
Beryllium	Toxaphene
Cadmium	PCB
Copper	Methoxychlor
Cyanide	Benzene
Hexavalent Chromium	Hexachlorobenzene
Lead	Chloroform
Mercury	1,2-dichloroethane

Nickel	1,1,1-trichloroethane
Phenolic Material	1,1,2,2-tetrachloroethane
Selenium	1,1-dichloroethylene
Silver	Trichloroethylene
Thallium	Tetrachloroethylene
Chlorine, Total Residual	Toluene
Zinc	Carbon Tetrachloride
Phthalate Esters	Polynuclear Aromatic Hydrocarbons
Halomethanes	

A summary of the size of the State's waters monitored for toxics, as well as the amount with elevated toxic levels, may be found in Table III-5. This summary indicates that elevated levels of toxics were present in 1,895 stream miles and 8,468 acres of lakes. These totals do not reflect streams impacted by acid mine drainage (over 2,300 stream miles). As mentioned earlier in this section, it is important to realize that toxics monitoring is usually only conducted on waters that are already suspected of being impaired. Due to this fact, it is impossible to make general assumptions regarding the extent of toxic contamination in State waters.

The identification and characterization of several toxic pollutant problems occurring during this reporting period have been addressed by a fish tissue monitoring program administered by the Water Resources Section. This program has been greatly curtailed due to a lack of analytical capability at the Section's organics laboratory. 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, pesticides, and other organic analyses are collected from 20-25 sites (two samples per site, each comprised of five fish) throughout the state.

During this report period, additional samples were collected for special studies such as those evaluating PCB contamination in the Shenandoah River and Flat Fork Creek, dioxin contamination in the Potomac and Kanawha River Basins, and PCB and chlordane impacts in the Ohio River. These sampling efforts are often a cooperative venture between state, interstate, and federal agencies.

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

Table III-5

Summary of Total Waterbody Size Affected by Toxics
03-25-93

Query condition: (ASDATE = 9112) AND (WBSEGNO = '00')

Waterbody Type / Units		Size Monitored For Toxics	Size with Elevated Levels of Toxics
Rivers	Miles	2168.56	1895.30
Lakes	Acres	16186.00	8464.10
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

Table III-6

TOXIC CONTAMINATION/PUBLIC HEALTH IMPACTS

Category of Impact: Fishing 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 2-28-91
Pocatalico River (K-29)	Dioxin	Unknown	2.00	Issued 3-1-86 All Fish
Armour Creek (K-30)	Dioxin	Unknown	2.00	Issued 3-1-86 All Fish Reissued 2-28-91
Ohio River (O)	Chlordane, PCB's	Unknown	277.00	Issued 6-14-89 Channel Catfish and Carp Reissued 3-15-91
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
North Br. Potomac (P-20)	Dioxin	Westvaco Pulp Mill, Luke Md.	50.50	Issued 9-7-89 Bottom Feeders Revised 6-30-91 Brown Bullhead
Potomac River (P)	Dioxin	Westvaco Pulp Mill, Luke Md.	38.00	Issued 9-7-89 Bottom Feeders Revised 6-30-91 Brown Bullhead
Flat Fork Creek (KP-33)	PCB's	Spencer Transformer Harmony, WV	5.00	Issued 2-4-91 Suckers, Carp Channel Catfish

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 except one advisory listed in the 1990 report have undergone either revision or reissuance. The lone exception is the Pocatalico River, which orininally had an advisory issued in 1986 for all fish due to dioxin contamination. This advisory is still in effect as originally issued. Reissued advisories include those on the Kanawha River and Armour Creek for dioxin and one on the Ohio River for PCB's/chlordane. Advisories that have undergone revision include the Shenandoah River, reduced from all fish to bottom feeders only, and the Potomac and North Branch Potomac, reduced from bottom feeders to brown bullhead only. Only one new advisory was issued during this report period...Flat Fork Creek in Roane County for suckers, carp, and channel catfish due to PCB contamination.

Information obtained from the State Department of Health indicates an increase this report period in the number of surface drinking water supply closures. Extensive monitoring of the various pollutants at the water intakes was directed by the Department of Health. Similar monitoring is conducted by ORSANCO on the Ohio River. The twelve closures of water treatment facilities this report period resulted in a total of approximately 30 "shut-down" days. The principal pollutants forcing these closures were turbidity ("natural" source), diesel fuel (from spills), and raw sewage (from lift station overflows). Information pertaining to water supply closures is detailed in Table III-7.

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, as expected, extremely variable. During this reporting period (July, 1989 - June, 1991) approximately 16 stream miles were affected by fish kills, with an estimated total mortality of 21,590 fish (game and nongame). This represents a significant decrease in the both the number of incidents and fish killed compared with the previous report 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

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	Size Affected (miles)	Comments
Dry Fork River (MC-60)	Turbidity	Natural	Not Determined	Closed various dates during report period. Affected 1 intake
Laural Fork (OGC-16)	Turbidity	Natural	Not Determined	Closed 7-26-89 Affected 1 intake
Guyandotte River (OG)	Turbidity	Natural	Not Determined	Closed various dates during report period. Affected 1 intake
Tug Fork (BST)	Diesel Fuel	CSX Railroad Accident	Approx. 30	Closed 4-15-91 Affected 1 intake
Pinnacle Creek (OG-124)	Turbidity	Natural	Not Determined	Closed various dates during report period. Affected 1 intake
Gauley River (KG)	Diesel Fuel	CSX Locom. Fuel Tank Leak	Approx. 5	Closure date not specified. Affected 1 intake
"	Turbidity	Natural	Not Determined	Closed 8-25-90 Affected 1 intake
Big Sandy River (BS)	Diesel Fuel	Ashland Oil Tug Boat Sank	Approx. 2	Closed 9-12-90 Affected 1 intake
North Fork Cherry R. (KG-34-H)	Fuel Oil	Unknown	Approx. 8	Closed 1-17-91 Affected 1 intake
Muddlety Creek (KG-26)	Raw Sewage	STP Lift Station Overflow	Approx. 1	Closed 6-9-90, 7-12-90, 10-18-90 4-18-91, 6-6-91, 8-8-91 Affected 1 intake
"	Turbidity	Natural	Not Determined	Closed 8-01-90 and 5-2-91 Affected 1 intake
"	Turbidity	Strip Mine Runoff	Not Determined	Closed 8-13-91 Affected 1 intake

Table III-8
TOXIC CONTAMINATION/PUBLIC HEALTH IMPACTS
Category of Impact: Fish Kills

Name of Waterbody (Code)	Pollutant(s) of Concern	Source(s) of Pollutant(s)	Size Affected (miles)	Comments
Buffalo Run (MC-22)	Ammonia	Coal mining	1.10	3-2-90, total kill, 103 fish
Bells Creek (KG-5-B) & Twentymile Creek (KG-5)	Acid mine drainage	Coal mining	3.50	10-6-89, total kill, 16 fish
Grassy Fork (KE-41-C-1)	Caustic soda	Coal mining	0.11	7-31-90, total kill, 47 fish
Unnamed Tributary of Broad Run (MW-33)	Pesticide	Residence	1.00	5-3-91, total kill, 11 fish
Sycamore Creek (MT-45)	Green concrete	WVDOH bridge construction	0.50	5-23-91, total kill, 401 fish
Guyandotte River (O-4)	Anhydrous ammonia	Coal Prep Plant	3.00	7-25-90, total kill, 18,670 fish
Sugarcamp Run (O-63)	pH excursion	Industrial	0.03	2-15-91, total kill, 19 fish
Pine Creek (OG-65-H) & Rt. Fork Pine Creek (OG-65-H-1)	Ammonium nitrate & diesel fuel	Coal Mining	6.50	5-3-91, total kill, 2,323 fish

not been able to establish any actual wetlands monitoring program, particularly as it would relate to public health/aquatic life concerns. It can be conceived that 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 which do not or are not expected to meet applicable water quality standards with technology based controls alone. Currently, five water quality limited streams are presumed to be affected by point sources. The remaining streams on the current 303(d) list are either impacted by nonpoint sources or impaired by an unknown source. The list is prioritized by first listing border streams, second including the heavily industrialized Kanawha River, and third sorting the remaining streams by number of miles affected.

TABLE III-9
303 (D) STREAM LIST
WATER QUALITY LIMITED WATERS

(Note: Streams are listed in order of priority)

	STREAM NAME	STREAM CODE	BASIN	MILES AFFEC.
1.	Ohio River	O	Ohio	277.00
2.	Potomac River	P	Potomac	38.00
3.	N. Branch Potomac	P-20	N. Branch Potomac	50.00
4.	Kanawha River	O-20	Kanawha	67.60
5.	West Fork River	M-26	Monongahela	103.00
6.	Guyandotte River	O-4	Ohio	102.00
7.	New River	K-81	Kanawha	87.00
8.	Tygart River	M-27	Monongahela	85.00
9.	Monongahela	M	Monongahela	37.50
10.	Stony River	PNB-18	N. Branch Potomac	24.50
11.	East Fork/ Twelvepole Creek	O-2-Q	Ohio	24.30
12.	Shenandoah River	S	Shenandoah	19.45
13.	Heizer Creek	KP-1	Kanawha	9.18
14.	Charley Creek	OGM-14	Ohio	8.70
15.	Manilla Creek	KP-1-A	Kanawha	7.37
16.	Turkey Run	MTB-10	Monongahela	7.04
17.	Buffalo Creek	BST-31	Big Sandy/Tug Fork	5.64
18.	Wiggins Run	P-14-A	Potomac	3.42
19.	Conner Run	O-77-A	Ohio	3.16
20.	Ices Run	M-23-A	Monongahela	3.10
21.	Dry Run	LK-3	Little Kanawha	3.05
22.	Buffalo Creek	M-23	Monongahela	3.00
23.	Ford Run	MT-27	Monongahela	2.70
24.	Buzzard Run	P-4-H	Potomac	2.58
25.	Gregory Run	MW-13-D	Monongahela	2.40
26.	Dry Monday Branch	BST-70-M-2-B-1	Big Sandy/Tug Fork	2.35
27.	Pocatalico River	K-29	Kanawha	2.00
28.	Armour Creek	K-30	Kanawha	2.00
29.	East Fork/ Greenbrier River	KNG-78	Kanawha	1.75
30.	Jarrett Branch	K-75	Kanawha	1.58
31.	Rich Fork/ Two Mile Creek	K-41-D.5	Kanawha	1.52
32.	Lick Branch/ Kanawha River	K-45	Kanawha	1.15
33.	Unnamed Tributary/ Wolf Run of Tannery Run	O-57.5-A	Ohio	1.00
34.	Pats Branch	BST-40-E	Big Sandy/Tug Fork	0.87

TABLE III-9
continued

	STREAM NAME	STREAM CODE	BASIN	MILES AFFEC.
35.	Unamed Tributary/ Tannery Run	O-57.5	Ohio	0.80
36.	Harmon Creek	O-97	Ohio	0.80
37.	Unamed Tributary/ Monongahela	M-23.5	Monongahela	0.50
			TOTAL	993.51

Chapter Three: Lake Water Quality Assessment

Background

In February 1989, the Water Resources Section of the West Virginia Division of Natural Resources (DNR) initiated a formal Clean Lakes Program with the help of a Section 314 grant from U.S. EPA. The program objectives established at that time were:

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.

In order to best accomplish these objectives, 12 publicly-owned lakes with known impacts were comprehensively sampled on a quarterly basis for a period of one year. In addition, 69 public lakes were sampled in cursory fashion once during the summer months, while one lake was sampled intensively for one year as part of a Phase I Diagnostic-Feasibility Study. Data was also obtained and evaluated for the ten U.S. Army Corps of Engineers' impoundments in the State.

A variety of chemical and physical parameters were evaluated in order to determine the general water quality, use support status, and trophic condition of each waterbody. Parameters were selected to help determine the impacts from siltation, nutrient enrichment, acid mine drainage, natural acidity, atmospheric deposition, and toxics. A list of sample parameters is provided in Table III-10.

By State definition, a significant publicly owned lake is any lake, reservoir, or pond owned by a government agency or public utility, at which 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.

There are currently 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 Appendix D-2.

Trophic Status

A trophic status summary for West Virginia's public lakes is given in Table III-11. Specific information on the trophic condition of individual waterbodies is provided in Appendix D-6.

Of the 78 lakes assessed for trophic status during this report period, 31 (40%) were classified as eutrophic, 29 (37%) were mesotrophic, and 18 (23%) were oligotrophic. 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

TABLE III-10
Sample Parameters for WV Lake Water Quality Assessment

Priority Lakes

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

Non-priority Lakes

Sulfate
Alkalinity
Acidity
Iron
Manganese
Secchi Depth
Turbidity
Temperature
PH
Dissolved Oxygen
Conductivity

TABLE III-11
Trophic Status Summary of 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).

(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 priority lakes, 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 were not considered accurate in lakes with high non-algal turbidity (i.e., muddy lakes). A summary of trophic state indices for priority lakes is given in Appendix D-3.

Trophic state indices for non-priority lakes were determined from either winter total phosphorus or summer secchi depth. 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 determination of non-priority lakes.

Control Methods

Presently, 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 Water Resources Section is reluctant to allow municipal discharges into public lakes, especially the smaller impoundments. At the present time, there are no discharges, either municipal or industrial, into any public lakes that are less than 630 acres in size. 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 the watershed.

Overall, nonpoint source pollution has a far greater effect on West Virginia's public lakes than does 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 siltation 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/or construction best management practices (BMP's) are being employed in these watersheds in an effort to curb runoff pollution.

At the present time, the State's nonpoint source control program relies almost entirely on voluntary compliance with BMP's by the various land development industries. Exceptions are the oil and gas and mining industries, which address nonpoint

pollution control through established regulations. For the remaining industries, no statewide laws or regulations on land use have been developed to protect lake or stream water quality. A few counties in the State have adopted local erosion and sediment control ordinances; however, the vast majority have no written laws to protect waters from runoff.

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

Restoration Efforts

Until recently, the Water Resources Section did not have a formal lake management program. Before the current Clean Lakes Program was initiated, lake management was primarily a function of the 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 Water Resources Section will offer guidance and technical support to any state or local agency sponsoring a lake related project. If Clean Lakes funding is involved, the Section will primarily act as a liaison between the local sponsor and the EPA.

Many methods are presently being employed to restore the water quality of public lakes. Lake specific information on restoration methods is provided in Appendix D-6.

In lakes affected by high acidity, pH neutralization is routinely employed. In lakes with aquatic vegetation problems, both chemical controls (e.g., aquatic herbicides) and biological controls (e.g., grass carp) have been utilized. In some instances, winter drawdown has been implemented in an effort to freeze the sediments and destroy certain aquatic plant species. Dredging is periodically carried out in some reservoirs affected by high siltation. In one U.S. Army Corps of Engineers' Reservoir, artificial circulation with destratification fans is currently being employed in an effort to improve water quality by lowering the epilimnion.

In any case, 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 initial focus of all state lake management efforts will be on pollution source control.

To date, the State has overseen the completion of one Phase I diagnostic-feasibility study at Mountwood Lake in Wood County, and is currently overseeing another Phase I study at Hurricane Lake in Putnam County. Both lakes are impacted by siltation. In addition, the State has obtained funding for two more Phase I studies, one 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.

Impaired and Threatened Lakes

The overall designated use support status for public lakes is presented in Table III-12. Of the 21,522.50 lake acres assessed, 5732.40 (27%) fully supported their designated uses, 1775 (8%) were fully supporting but threatened, 12,285.10 (57%) were partially supporting, and 1730 (8%) were non-supporting.

A summary of specific designated uses is provided in Table III-13. 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 is also reported under two categories: swimming and secondary contact recreation. During the last report period (1987-1989), the State was very lenient in its assessment of the Clean Water Act fishable goal. Generally, any lake which supported what was judged to be an adequate population of gamefish was considered to fully support the fishable goal, regardless of the water quality status. For the current report period, however, water quality status weighs heavily in the overall assessment of the fishable goal. Under current federal guidelines, violations of state water quality criteria above a certain level of frequency are automatically assumed to affect a lake's fishability.

All 21,522 lake acres assessed during this report period fully supported the swimmable use. However, only 20,837 acres fully supported the secondary contact recreation use. The secondary contact recreation use was partially supported by 685.50 acres. The lakes which partially supported this use had some type of physical impairment such as silt bars or aquatic macrophytes which impeded activities such as recreational boating.

For the aquatic life support use, 7773.90 (36%) of the lake acres assessed were fully supporting, 1775 (8%) were fully supporting but threatened, 10,423.60 (48%) were partially supporting, and 1730 (8%) were non-supporting. Two lakes, Tygart and Spruce Knob, comprised the 1775 acres of threatened waters. Tygart is threatened by acid mine drainage while Spruce Knob is threatened by natural acidity. Cheat Lake comprised the entire 1730 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.

TABLE III-12

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	5729.30	5732.40
SUPPORTING BUT THREATENED	0.00	1775.00	1775.00
PARTIALLY SUPPORTING	2.00	12283.10	12285.10
NOT SUPPORTING	0.00	1730.00	1730.00
NOT ATTAINABLE	0.00	0.00	0.00
TOTAL SIZE ASSESSED	5.10	21517.40	21522.50
NOT ASSESSED	0.00	0.00	0.00

TABLE III-13

USE SUPPORT MATRIX SUMMARY TABLE

WATERBODY TYPE: LAKES

(all size units in Acres)

USE	SUPPORTING	SUPPORTING BUT THREATENED	PARTIALLY SUPPORTING	NOT SUPPORTING
OVERALL USE SUPPORT	5732.40	1775.00	12295.10	1730.00
AQUATIC LIFE SUPPORT	7773.90	1775.00	10243.60	1730.00
FISH CONSUMPTION	91.00	0.00	0.00	0.00
COLD WATER FISHERY (TROUT)	3716.50	25.00	121.60	0.00
WARM WATER FISHERY	6317.40	1750.00	11454.00	1730.00
SWIMMABLE	21522.50	0.00	0.00	0.00
SECONDARY CONTACT RECREATION	20837.00	0.00	685.50	0.00
DRINKING WATER SUPPLY	5037.00	1750.00	0.00	0.00
INDUSTRIAL USE	1980.00	0.00	0.00	0.00
WILDLIFE	38.00	0.00	0.00	0.00

Pollution cause categories for lakes classified as less than fully supporting are listed in Table III-14. Considering both major and moderate/minor impacts, metals were found to have the greatest impact on lakes, followed by siltation, PH, and organic enrichment/DO. Other factors causing lake impairment were total toxics, nutrients, thermal modification, noxious aquatic plants, dissolved solids, turbidity, and chlorine.

Pollution source categories for lakes classified as less than fully supporting are provided in Table III-15. Overall, resource extraction (i.e., coal mining) affects more lake acres than any other activity, followed by domestic sewage, agriculture, and silviculture. Petroleum activities (i.e., oil and gas drilling) and industrial point sources also affect a fairly large amount of lake acreage.

Lake specific information regarding causes and sources of impairment is provided in Appendix D-6.

As mentioned earlier, water quality standards promulgated by the State Water Resources Board for streams are also 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 priority lakes are given in Appendix D-4, with violations of State water quality criteria (West Virginia State Water Resources Board, 1990) footnoted. Likewise, physico-chemical characteristics of non-priority lakes are provided in Appendix D-5.

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 present in high concentrations, particularly in the hypolimnion (i.e., bottom waters). Accumulation of metals and other pollutants in reservoirs is not unusual, since reservoirs by their very nature act as sinks for pollution originating in the watershed. In addition to metals, pH was found to violate water quality criteria in some of the lakes affected by high acidity.

Many of the lakes sampled during this assessment experienced hypolimnetic oxygen depletion in the summertime. This 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 drop of >10 mg/l occurred between the surface and six foot depth (indicating severe stratification) or 2) the concentration was less than 5.0 mg/l for any reading taken between the surface and four foot depth.

Acid Effects on Lakes

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.

Currently, four lakes totalling 2,743 acres are considered to be affected by high acidity. In addition, three lakes totalling 2,975 acres are threatened by acidity, but are

Table III-14

305(b) Relative Assessment of Causes
03-29-93

Query condition: (WBTYPE = 'L' AND ASDATE = 9112) AND (WBSEGNO = '00')

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	3757.10	2995.50
Unionized Ammonia	0.00	0.00
Chlorine	0.00	3.50
Other inorganics	0.00	0.00
Nutrients	0.00	2789.50
pH	2743.00	1200.00
Siltation	369.50	5480.00
Organic enrichment/DO	30.00	31.50
Salinity/TDS/chlorides	8.00	0.00
Thermal modifications	1200.00	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	0.00
Taste and odor	0.00	0.00
Suspended solids	0.00	0.00
Noxious aquatic plants	49.00	0.00
Filling and draining	0.00	0.00
Total toxics	2302.00	0.00
Turbidity	30.00	0.00
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

Table III-15
305(b) Relative Assessment of Sources
03-29-93

Query condition: (WBTYPE = 'L' AND ASDATE = 9112) AND (WBSEGNO = '00')

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	1200.00	0.00
Municipal Point Sources	0.00	3.50
Combined Sewer Overflow	0.00	0.00
Agriculture	39.50	2093.50
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	149.00	1636.50
Harvesting,restoration,residue managemt	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	3911.00	2040.00
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	198.50	730.00
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
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

Table III-15 continued
305(b) Relative Assessment of Sources
03-29-93

Query condition: (WBTYPE = 'L' AND ASDATE = 9112) AND (WBSEGND = '00')

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
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	2772.00
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	1543.10	0.00

currently not significantly impacted. The primary measure used to determine acidic condition is pH. Acid affected lakes are those which 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. 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. Both are partially supporting. Tygart, Mount Storm, and Spruce Knob lakes are threatened by high acidity, but at this point are not considered significantly impaired. Tygart and Mount Storm lakes (2,950 acres) are threatened by watershed AMD while Spruce Knob lake (25 acres) is threatened by acid precipitation and natural acidity.

Currently, 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 them to discharge highly alkaline water (pH 10-11) into the lake for the express 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 approximately 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 to remove toxic metals or other toxic substances mobilized by high acidity.

Toxic Effects on Lakes

Presently, no publicly-owned lakes are included in any of the 304(l)/303(d) lists.

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 ten U.S. Army Corps of Engineers' impoundments and three of the State's priority lakes: Mount Storm, Summit, and Mountwood Park. Of the 16,186 lake acres monitored for toxics, 3270 (20%) 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, while 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. For purposes of this assessment, sampling of non-priority metals such as iron and manganese was not classified as toxics monitoring.

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 effects of toxics on West Virginia lakes are not well documented. Additional sampling needs to be carried out in order to gain a better understanding of toxic impacts.

Trends in Lake Water Quality

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 ten U.S. Army Corps of Engineers' Reservoirs have sufficient data available for an accurate trend assessment.

Of the eleven 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 was also taken into account. An approximate time frame of ten years was chosen to substantiate trend analysis.

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

Special Studies: Mountwood Park Lake

As mentioned on Page 3 under Restoration Efforts, a Phase I Diagnostic-Feasibility Study was completed at Mountwood Park Lake in August 1991. The physical, chemical, and biological conditions of this 48 acre reservoir were evaluated in great detail to determine the causes and magnitude of water quality impairment.

The lake was basically found to be impacted by excessive sedimentation; largely a result of watershed soil erosion. A severe buildup of sediment was noted on the upper end of the lake in the vicinity of tributary inflows. In addition, dense growths of aquatic macrophytes were discovered near the tributary inlets. Water quality was generally good,
with the lake being classified as late mesotrophic/early eutrophic. It was generally concluded that by controlling watershed erosion, most of the water quality problems at Mountwood Park Lake could be eliminated.

Among the restoration alternatives suggested in the management plan were streambank stabilization, revegetation of critically eroding areas, construction of sedimentation basins, stabilization of roadside drainage ditches, dredging, and

modification of the dam outlet structure. The total estimated cost of lake restoration was $1,554,500.

Detailed water quality information, as well as a lake and watershed management plan, may be found in the Mountwood Park Lake Phase I Study Final Report (F.X. Browne Associates, 1991).

Literature Cited

Browne, F.X. Associates, Inc. 1991. Diagnostic-Feasibility Study of Mountwood Park Lake, West Virginia. F.X. Browne Associates, Inc., Lansdale, PA.

Carlson, R.E. 1977. A trophic state index for lakes. Limnol. Oceanogr. 22:362-369.

West Virginia State Water Resources Board. 1990. Title 46, Emergency Legislative Rules: Requirements Governing Water Quality Standards, Series 1. West Virginia State Water Resources Board, Charleston, WV.

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 derived from this document. The WVWCP may be found in Appendix B, providing additional detail to this summary.

Historical data on the State's wetlands is somewhat scarce and for the most part incomplete. Some historical information is discussed in the following narrative regarding trends. The National Wetlands Inventory (NWI) indicates the presence of approximately 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 one percent (1%) of the State's land and water area is wetland.

Data presented in the NWI does enable one to derive trends in total wetland loss/gain in West Virginia. 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 was also experienced during this 23-year time period. An overall analysis of these trends thus indicates gains in both vegetated (51,000 acres) and nonvegetated (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 and evidence of wetland inundation and saturation for 15 and 21 days, respectively. 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.

The wetland areas in West Virginia which 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 West Virginia Division of Natural Resorces provided in-depth comments in regard to the proposed guidelines and estimated without substantial revision to the proposal, the state may lose an estimated fifty percent of its transitional wetlands.

The Federal Delineation Manual is important in protection of the State's wetlands as it is the method by which the U.S. Army Corps of Engineers (COE) determines the wetland area which may be impacted by a permit application purauant 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 primary 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-16 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 report period to provide an accurate update. Hopefully 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 presently have uses designated for wetlands and as such use attainment information is not applicable. Futhermore, the state does not have a formal wetland monitoring program.

Development of Wetland Water Quality Standards

A summary of the development status of wetland water quality standards is provided in Table III-17.

West Virginia's wetland management program basically involves protection through regulation and acquisition of these wetlands. 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, currently water quality standards for the State do not separately classify wetlands as a water use category.

West Virginia currently does not have any type of wetland protection legislation, nor has the antidegradation policy been used for wetland protection. The latter, however, is applicable for wetlands. Permitting authority of 404 activities is maintained by the U.S. Army Corps of Engineers in West Virginia. 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 begun by submitting proposed revisions to Title 46, Regulations Governing Water Quality Standards. The proposals includes a revision of 3.2.i of the conditions not allowable in State waters which as amended states:

> Any other condition, including radiologicalexposure, 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.

Table III-16
Extent of Wetlands, by Type

Wetland Type	Historical Extent acres (1)	1990 305(b) Acreage (2)	Most Recent Acreage (3)	% 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:

1 National Wetlands Inventory
2 " " "
3 " " "

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

Table III-17
Development Status of State Wetland Water Quality Standards

	In Place	Under Development	Proposed
Use Classification			X
Narrative Biocriteria		X	
Numeric Biocriteria		X	
Antidegradation	X		
Implementation Method		X	

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 antidegradation 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 has used the antidegradation policy for wetland protection in 1991 in two specific instances. 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 Resources Waters in accordance with the water quality standards. In a seperate case, the Water Resources Section advised National Forest unit that wetlands in the National Forest were classified as National Resource Waters and were therefore protected by the antigradation policy to the fullest extent possible (i.e., nondegradation).

Additional Wetland Protection Activities

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 developed 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.) development of a mitigation policy for wetland impacts

e.) assisting State wetland watch groups, and

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

Efforts to incorporate wetland protection into other water 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 water programs such as Clean Lakes and ground water protection are relatively new activities for West Virginia, and have therefore not had time to consider expansion into 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 Division of Natural Resources' Office of Environmental and Regulatory Affairs administers the State's wetland protection activities through the 401 certification program. This program is coordinated through the Wildlife Resources Section, with comments sought from the Water Resources Section. The State Division of Forestry advises the avoidance of streams and wet areas on silviculture operations, while relying upon the support of the Water Resources Section for enforcement of water quality violations resulting from these operations.

Ground Water Quality

Part IV: GROUND WATER QUALITY

Overview

"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. Ground water quality in developed/industrialized/ mined areas of the state often reflects the strong influence man has on his environment. One does not have to look far in these areas to find elevated levels of organics, inorganics, or bacteria. Legislation passed in June, 1991, the Groundwater Protection Act, provides West Virginia with the necessary framework to effectively manage the states priceless ground water resource. The legislation provides authority to collect fees for program operations and remediation efforts, grants authority to the Water Resources Board to set ground water quality standards, and allows for the creation of ground water protection practices. As the passage of the Groundwater Protection Act has a significant impact on the way the resource will be managed, a substantial amount of this report will focus on the issues which will become a reality as the new law is implemented.

The following report will also summarize the results of 1) a study in which pesticides are tested for in rural wells of three counties. 2) a study of water quality impacts of agriculture in karstic southeast West Virginia. 3) A national demonstration project in Jefferson County to study pesticide contamination. In addition, a general discussion of major aquifer groups in West Virginia will be provided.

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). West Virginia also has numerous chemical plants, industrial facilities, limestone & gravel quarries, and commercial farm operations. Historically, industry has left environmental problems behind. Today most activities which threaten ground water quality are regulated in some manner. West Virginia has 40,000 known oil and gas wells, 2,600 permitted mining facilities, 289 permitted facilities with industrial discharges, 1,464 dischargers of municipal wastewater, registers 6,500 pesticides per year, deposits two million tons of solid waste per year, generates 40,000 tons of hazardous waste per year, has 645 class II and III injection wells, over 1200 suspected Class V injection wells, issues permits for 7,500 septic tank installations/modifications per year and has over 14,000 regulated underground storage tanks. The magnitude of potential groundwater pollution sources is illustrated in Figure IV-1.

Monitoring well data from many of the above facilities/ activities is collected as part of the permitting/regulatory process but is not readily available for analysis on a statewide or industry scale as the data are not in computerized form. Therefore the information in Table IV-1 and Table IV-2 is subjective based on conversations with numerous regulatory personnel. A much more objective report on the quality of the states ground water should be available in subsequent 305(b)

Figure IV-1

Ground Water Potential

Pollution Sources

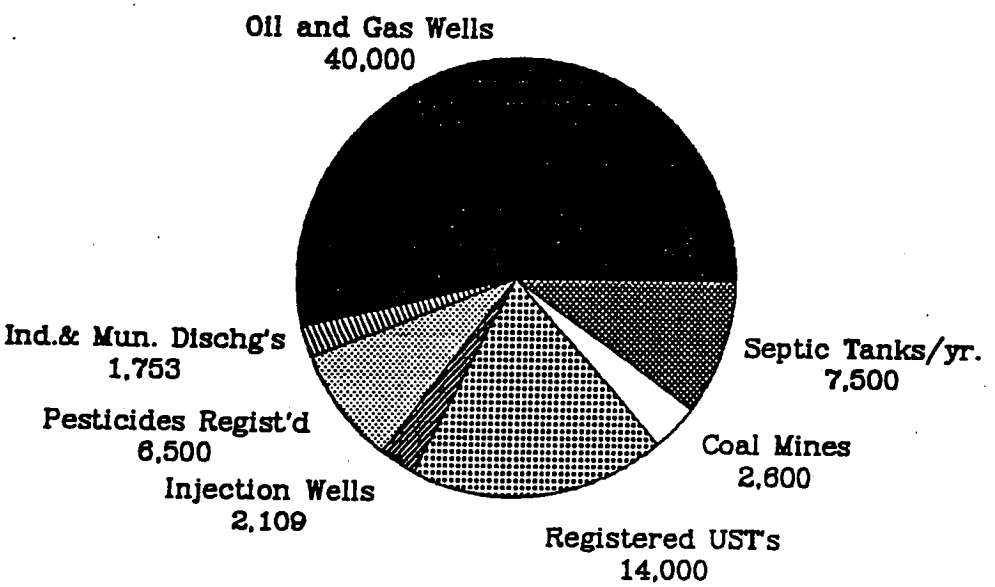


Table IV-1
MAJOR SOURCES OF GROUND-WATER CONTAMINATION

SOURCE	INCIDENTS REPORTED	RELATIVE PRIORITY
Septic tanks	X	3
Municipal landfills	X	2
On-site industrial landfills (excluding pits, lagoons, surface impoundments)	X	
Other landfills	X	
Surface impoundments (excluding oil & gas brine pits)	X	4
Oil & gas brine pits	X	
Underground storage tanks	X	
Injection wells (inc. Class V)	X	5
Abandoned hazardous waste sites	X	
Regulated hazardous waste sites	X	
Salt water intrusion	X	
Land application/treatment	X	
Agricultural activities	X	
Road salting	X	
Acid mine drainage	X	1
Abandoned wells	X	

Table IV-2
SUBSTANCES CONTAMINATING GROUND WATER

Organic chemicals:	
Volatile	X
Synthetic	X
Inorganic chemicals:	
Nitrates	X
Fluorides	
Arsenic	X
Brine/salinity	X
Metals	X
Radioactive material	
Pesticides	X
Other agricultural chemicals	
Petroleum products	X
Other (fecal coliform)	X

reports as ambient monitoring and improved data management will take place as part of the new Groundwater Protection Act.

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. Apporximately 55% of all groundwater used for public supply is 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).

New Legislation

In early 1991 the Groundwater Protection Act was approved by the legislature and signed into law by the governor. In previous years legislation to protect ground water had been introduced but failed to become law. Recognizing the need for such legislation, and the wide variety of interests which would be affected by the legislation, the governor appointed a 12 member task force, composed of regulators, industrial representatives and environmentalists, whose mission was to reach a compromise on ground water legislation. The product of the task force was a bill which is both protective of ground water and recognizes that a strong industrial base must be maintained.

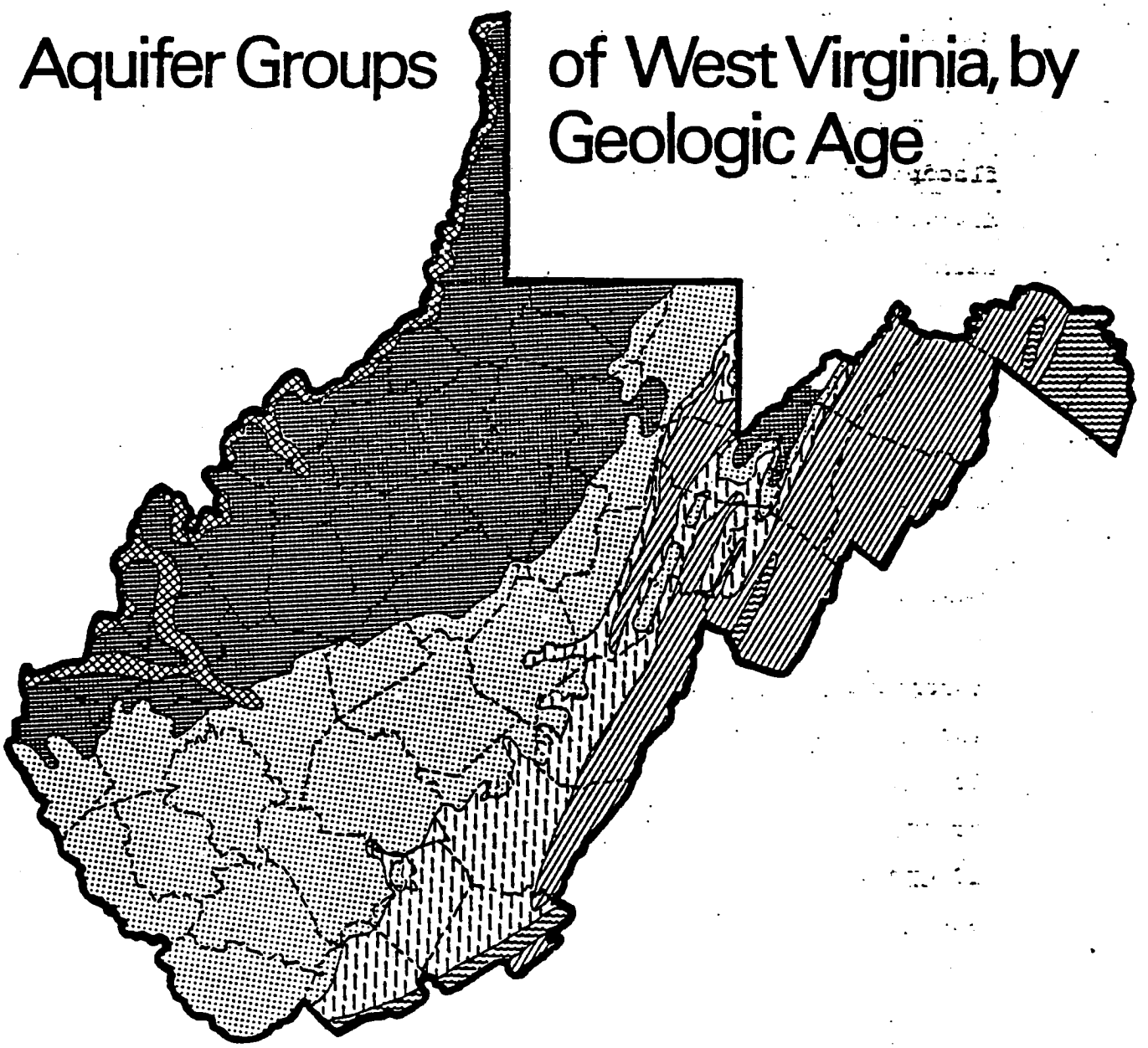
A summary of the major features of the Groundwater Protection Act is as follows:

Of primary importance is the establishment of a policy with regards to ground water protection. The policy states "... that it is the public policy of the state of West Virginia to maintain and protect the state's groundwater so as to support the present and future beneficial uses and further to maintain and protect groundwater at existing quality where the existing quality is better than that required to maintain and protect the present and future beneficial uses. Such existing quality shall be maintained and protected unless it is established that (1) the measures necessary to preserve existing quality are not technically feasible or economically practical and (2) a change in groundwater quality is justified based upon economical or societal objectives. Such a change shall maintain and protect groundwater quality so as to support the present and future beneficial uses of such groundwater". (WV GWPA 1991) Pollution of ground water will not be considered a beneficial use.

The Groundwater Protection Act gives 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 and can be more stringent than EPA drinking water standards, and 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 which allows for variances for specific activities. Also the standards "... shall recognize the degree to which groundwater

Figure IV-2

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.

is hydrologically connected with surface water and other groundwater and such standards shall provide protection for such surface water and other groundwater". (WV GWPA, 1991)

In addition to groundwater standards the groundwater regulatory agencies are given the authority to establish preventative action limits. Preventative action limits "... once reached, shall require action to control a source of contamination to assure that such standards are not violated". (WV GWPA, 1991)

Groundwater regulatory agencies will be required to "... develop groundwater protection practices to prevent groundwater contamination from facilities and activities within their respective jurisdictions ... such practices shall include, but not be limited to, criteria related to facility design, operational management, closure, remediation and monitoring" (WV GWPA, 1991)

The Division of Natural Resources 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 states ground water and ground water management programs, and to develop rules regarding the monitoring and analysis of ground water.

All groundwater regulatory agencies are authorized to conduct studies, secure cooperation of interested entities, conduct ground water sampling, and to develop public education and promotion programs.

Funding for both program operation and remediation efforts was allowed for in the legislation. Groundwater regulatory agencies are allowed to collect up to one million dollars annually from facilities or activities who have the potential to impact ground water quality. This one million dollars will be deposited into the groundwater protection fund. Ground water regulatory agencies are also allowed to collect $250,000 over a two year period. This $250,000 will serve as seed money for the groundwater remediation fund. Subsequent funding of the groundwater remediation fund will come from the proceeds of civil and civil administrative penalties. Monies spent from the groundwater remediation fund and recovered from responsible persons will also go into the fund.

Passage of the Groundwater Protection Act should have a positive impact on the groundwater in West Virginia. It provides regulatory agencies with the funding and guidance to obtain, maintain, and analyze the data necessary to provide a 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 Groundwater Protection Act all come to fruition West Virginia's groundwater should indeed become a well managed and closely monitored resource.

Completed/Ongoing Studies

The West Virginia Department of Agriculture (DOA), the state agency responsible for the enforcement of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), conducted a study in three counties to determine pesticide and fertilizer use and to determine the presence of pesticides in ground water from the sites primary drinking water source. The three counties chosen were Putnam, Lewis and Preston. These counties were chosen as most previous work had been done in karst areas and little was known about pesticide quantities in ground water in non karst areas.

The sampling target, 30 percent of the certified private applicator's sites, was met in Putnam, and Lewis counties. Seventy five percent of the goal was met in Preston county. "In summary, 109 participants were surveyed and 119 sites (88% of the total program goal) were sampled. Ten sites tested positive for pesticides. All detections were within acceptable levels. Follow-up duplicate samples taken from all positive sites tested negative. This may indicate seasonal impacts as opposed to persistent contaminations" (WV DOA) .

Pesticides detected in the study include: Atrazine - 2 wells, Diazinon - 1 well, Chloropyrifos - 3 wells, Alachlor -1 well, Picloram - 2 wells, Triclopyr - 2 wells. (Note: one well in Preston County had detections for two pesticides) These results are encouraging but continued research in other counties will be needed to clearly understand if there are problem areas related to pesticide contamination in West Virginia.

A study entitled Water Quality Impacts of Agriculture in Southeast West Virginia began in June 1990. The objectives of the project are to 1) Determine if animal grazing systems are a source of ground water contamination in Appalachian Karst terrain. and 2) Determine the water budget of individual sinkholes and their potential role in the ransport of contaminants to ground water flow.

" The primary study area is the Hole Basin, a 5.6 square mile area in Greenbrier County, West Virginia. There are 38 farms within the Hole Basin. A land use survey indicated that approximately 68 percent of the total land area is in pasture, 10 percent is in crops or hay, and 20 percent is wooded". (Pasquarell, et al 1991) Stream and spring sampling occurs weekly at six sample locations. Sampling parameters include: nitrates, fecal coliform, fecal streptococcus, triazine, temperature, pH, conductivity, and dissolved oxygen. Preliminary study results indicate that mean pH values range from 7.3 to 7.47, mean conductivity values range from 170.2 to 407.1 micromhos/cm, mean dissolved oxygen ranges from 93.1 to 103.5 percent saturated, mean Nitrate as NO ranges from 4.0 to 14.6 ppm, mean fecal coliform ranges from 170 to 510 colonies per 100 ml., and mean fecal coliform to fecal streptococcus ratios range from 0.7 to 1.4. Laboratory triazine data is not yet available, however preliminary screenings indicate the presence of triazine at less than 1.0 ppb.

It is obvious that water quality impacts are occurring in this karst region. "Although contaminant levels are within EPA

advisory limits, it is clear that the Karst system requires careful management. For example, although less than 10 percent of the land area is in crops, triazine pesticides apparently occur at detectable levels in the groundwater. If this result is confirmed, it could lead to stricter guidelines for the use of pesticides and fertilizers on Karst landscapes" (Pasquarrell et. al., 1991).

Study of the karst system in Jefferson County, involving numerous federal, state and county agencies, is nearing completion. "EPA is conducting a Geographic Information System (GIS) Demonstration project in Jefferson County, West Virginia. The objective of this project is to demonstrate the use of GIS to support development of State Pesticide in Ground Water Management Plans, as well as enhance overall State Nonpoint Source and Ground Water Protection Programs." (EPA, 1990) EPA also contracted to develop an Agricultural Practices Survey format, which once completed will be used in subsequent projects.

The the project is large in scope, involving geologic mapping, sinkhole delineation, dye-tracer studies, septic tank and water well locating, digitizing of all available and pertinent information, surveying pesticide use, and developing ground water policy options. Similar work is also being performed in neighboring Berkeley County. For purposes of 305(b) reporting, only ground water quality results will be discussed.

Well water samples from 20 selected homesites and 45 wells found in two major subdivisions were sampled at three to four month intervals for nitrates. "Conclusions drawn from the screening study showed no evidence of a high nitrate concentration problem in the sample sites of the county. This general conclusion challenges some findings and generalizations posited by other agencies of the state and federal governments. However, previous findings and generalizations by those agencies were (for the majority of cases) drawn from a very limited study." (Green, 1991)

"Seasonal variations in the measured levels of nitrates were evident; and the range of seasonal variance within sample sites indicated slight differences to extreme differences (but again, there were no sites of chronic nitrate contamination)." (Green, 1991) As previously stated similar work is ongoing in Berkely County, samples from 37 sites are being collected and analyzed for nitrates and fecal coliform bacteria. Samples are being collected at four month intervals and the study is scheduled to conclude in the summer of 1992.

Conclusions

Analysis of the text in this report reveals that West Virginia is moving forward in ground water protection via federal, state, and local efforts. We know that areas of contaminated ground water exist and are thankful that a new tool for protecting and improving the resource has been provided. 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 towards effectively managing the state's ground water resource should be made.

The studies detailed in this report show conflicting results. Two studies reveal relatively good ground water quality while the third suggests that the resource is being degraded. The Groundwater Protection Act requires all groundwater regulatory agencies to routinely store all ground water data in a centralized location. When this system becomes operational and GIS technology is employed, we may then begin to truly understand the status of West Virginia's ground water quality.

Water Pollution Control Program

PART V. WATER POLLUTION CONTROL PROGRAM

Chapter One: Point Source Control Program

The objectives of the 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 has resulted in substantial pollution reductions in all state waters, particularly in the realm of conventional pollutants. It has also provided states a greater latitude to require additional reductions in effluent loadings of these pollutants. BAT limits are generally adequately stringent since the vast majority of major dischargers are located on large rivers which have a great amount of assimilative capacity to accept wastes. Water quality on these larger rivers has shown a gradual improvement over the past few decades.

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

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

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

The Section maintains a quality assurance/quality control (QA/QC) laboratory inspection program. This program is a means of reviewing analytical testing procedures and results utilized by various laboratories across the State. The maintenance of acceptable QA/QC procedures is imperative in order to insure the analytical information submitted to the Section is accurate. During this reporting period (July 1989-June 1991) approximately 146 various types of laboratories (coal, commercial, industrial, and municipal) were inspected by Water Resources Section personnel.

In order to address the discharge of toxic pollutants, the Section has worked with several industries in the development of individual control strategies (ICS), as directed under section 304(l) of the Clean Water Act. These strategies have proven effective in reducing toxic discharges to State waters. The State Water Resources Board has also adopted several water quality criteria for organic constituents in order to address the

toxics issue. Another major effort within the Section in addressing toxic discharges is an increase in the toxicity testing program. This testing is performed by the Program Management/Technical Support (PM/TS) Branch in close coordination with the Permits Branch. This effort serves to provide toxics information as it relates to a particular discharge. The results provided 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, and an increased use of toxicity testing as a permit requirement for the purpose of toxics evaluations.

The Water Resources Section also maintains a field inspection staff which is responsible for a variety of pollution control tasks. The inspectors maintain close contact with permitted facilities and carry out activities which have an immediate and long-term effect on the water quality of the state.

The first priority of the inspectors is the immediate investigation of fish kills and spills. These are of major importance to the integrity of the waters of the state. Investigation must be immediate and 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. Quick determination of downstream drinking water intakes are determined by the inspector and steps are taken to protect them. Types of spill investigations include pipelines, truck wrecks, chemical accidents, oil and gas activities, train derailments and others.

Complaint investigation is secondary in priority. Screening is conducted at the local level to determine if immediate response is needed. Complaints originate primarily from private citizens or emergency personnel (fire departments, sheriff's departments, State Police, etc.). Serious complaints are investigated immediately and procedures are much the same as for spills.

Routine facility inspections occupy the largest portion of the inspector's time. Inspections of all permitted facilities are conducted and include both 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 enforcement actions necessary in the removal of such dumps.

When needed, enforcement action is initiated to correct problems. This may consist of an administrative action, a 20-day letter, a notice to comply, or a criminal warrant. Inspectors may recommend the initiation of civil action for very serious pollution problems. The recommendation is forwarded to the Attorney General's Office by the Section. This type of enforcement action is very time consuming and is usually taken as a last resort, after other attempts to correct the problem have failed.

Inspection of activities covered under the erosion control program is another important function of the field inspector. Preparation of drilling, 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 Planning Branch's nonpoint source personnel.

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 no longer conducted by Water Resources, as these facilities are currently the responsibility of the Division of Energy.

Table V-1

FIELD OPERATIONS ACTIVITIES
JULY 1989 - JUNE 1991
(grant commitment number in parentheses)

Activity	Number
A. Report:	
- Enforcement letters and notices issued	791
- Criminal enforcement actions initiated	161
- Administrative actions recommended	20
- Civil actions recommended	0
B. Prepare:	
- Reports of Investigation	34
- Monthly prosecution reports (24)	24
- Monthly enforcement letter reports (24)	24
C. Investigate:	
- Complaints	3058
- Spills	878
- Aquatic life kills	49
D. Conduct:	
- Field reviews of permit applications	153
- Compliance Evaluation Inspections (200)	223
- Sewage treatment plant walk through inspections (2660)	4942
- Industrial waste treatment plant walk through inspections (810)	1422

Chapter Two: Nonpoint Sources Control Program

The Water Quality Act of 1987 brought about the requirement that programs for the control of nonpoint sources of pollution be developed and implemented. 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 1673 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 was also 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 which can be used to deal with the complex problem of nonpoint source pollution.

The West Virginia Division of Natural Resources' Water Resources Section, as the lead agency for the State's nonpoint source program, works with other cooperating state agencies to assess nonpoint source impacts, then develop and implement projects designed to reduce pollutant loads from agricultural, silvicultural, resource extraction, and construction activities. The Water Resources Section 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, demonstrations, 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: Water Resources Section (lead agency), Division of Energy, Soil Conservation Committee and the 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. Activities in the agriculture and construction base program include personnel management, public education, technical assistance, financial assistances, research, and regulatory activities, as well as educational and management activities associated with the Milton and Southern Construction Demonstration Projects. Forestry projects include educational efforts by the Forest Water Quality Compliance Committee and the WVU Extension Service; and erosion monitoring on watersheds impacted by forest fires.

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

Save Our Streams

The Izaak Walton League of America helps coordinate a program for citizen participation in monitoring West Virginia's streams.

Bioengineering Demonstration

A streambank stabilization demonstration project will be implemented in order to educate landowners about sediment loads from eroding streambanks and measures which can reduce the problem, and to test various biological and engineering streambank stabilization practices.

Cedar Lakes Multistate Nonpoint Source Resources and Training Center

The training facility, which can accommodate about 50 participants at a time, will be used to educate and train technicians, professionals, and interested members of the public sector about specific nonpoint source issues and implementation of management practices. A coordinator will be hired, the curriculum will be developed, promotional material will be prepared and distributed, and demonstration sites will be maintained.

Mason County, Kanawha River Basin Nutrient and Pesticide Demonstration Project

The project will emphasize dissemination of information to the public concerning protection of water quality by waste management, soil conservation, water management and pesticide information. Nutrient management plans will be developed, animal waste holding facilities will be designed, technical assistance will be given with recommendations on plant cultivars with increased insect/disease genetic resistance, and IPM/IPC plans will be developed.

Tomlinson Run/Northern Panhandle SCD Watershed Demonstration Project

Streambank and roadbank stabilization projects, review of thirty to forty sediment and erosion plans, sediment and erosion

workshops, and citizen monitoring are key aspects of this project.

Potomac Valley and Eastern Panhandle Soil Conservation Districts Nutrient and Pesticide Management Demonstration Project

Information and education activities will be used to promote sustainable agriculture 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.

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 National Acid Mine Abatement Demonstration

Funds will be used to evaluate and implement abatement technology at sites identified as causing major stream degradation. These funds will be expended for obtaining current land use classifications inside the project area, for completing mapping of old underground and surface mine sites permitted by WVDOE, for development of water quality predictive GIS modeling, and for design and installation of natural abatement technology to eliminate sources of contamination.

Regional Applied Research Effort (RARE) Project and Ecoregion Reference Site Selection

Funds will be used to study application of Rapid Bioassessment Protocols for assessing strip mining impacts in West Virginia. Funds also allow selection of sites, sampling, and identification of fauna from ecoregions in West Virginia. Data will be incorporated into the NPS GIS.

As part of the Division's nonpoint source control program, complaints registered and/or inspections performed pertaining to nonpoint source pollution have been tracked using an electronic file. During the period beginning July 1, 1989 and ending June 30, 1991, water pollution complaints and/or inspection activities emanating from seven (7) nonpoint pollution categories were compiled. All complaints entered into this tracking system were inspected, however all inspections did not necessarily have a complaint filed, and more than one complaint could be filed on a particular activity. A breakdown of these complaints and inspection activities resulted in the following summary by nonpoint category:

Agriculture (Ag)	17
Construction (Cn)	177
Hydrologic/Habitat (HH)	133
Resource Extraction (RX)	40
Silviculture (Si)	392
Urban Runoff (UR)	12
Other (OR)	60
TOTAL	830

These figures are intended to represent the activities of the Division's inspectors and are not necessarily representative of water quality violations. These inspections are not performed randomly, but are generally a response to "worse-case" situations. The State Division of Forestry documented 250 silviculture related complaints for the period, in contrast with the Division of Water Resources' 392 silviculture activity inspections. The Division of Forestry's computer tracking system for complaints was not fully operational during the period in question, which is probably the main reason for the disparity in complaints recorded. Improved communication between the cooperating agencies on complaints has been achieved in order to better coordinate the inspections of silviculture operations. This has lead to a better balance in complaint inspections recorded.

Chapter Three: Cost/Benefit Assessment

A true cost/benefit analysis on the economic and social costs and benefits of water pollution control is a difficult and time consuming task. Particularly, the evaluation of industrial facilities would be monumental considering the various types of industry (mining, chemical, electro-plating, glass manufacturing, power generation, etc.), all having very different processes of pollution control. It would be a full-time job to make such an analysis. However, an idea of some of the costs involved in maintaining water quality can be obtained from the operation and maintenance of, and investment in municipal facilities.

The cleanup of wastewater form 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 1991 the DNR approved 194 applications from communities statewide which applied for EPA grants to construct wastewater systems. The cumulative total of all of these federal grants was over $630 million. When you add to that total the local share costs of the projects, over $1 billion has been spent on these systems. This represents a major economic investment in this infrastructure category in West Virginia, not to mention the great improvement in the quality of the receiving streams in these communities. There have been 90 sewage treatment plants built since 1972 in addition to 66 separate interceptor/collector systems. At the end of calender year 1991, there were still 20 systems under construction and 27 systems not yet under construction. It is estimated that it will take DNR until 1995 to complete these remaining projects. As the EPA Constuction Grants Program is now winding down as mandated by Congress, the DNR is starting to implement the new State Revolving Fund loan program under which future wastewater systems will be funded and built.

Another good 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% of these major facilities were not in compliance with the federal Water Pollution Control Act. Presently, 38 of the 39 facilities have constructed at least secondary treatment. The remaining facility has received a grant to upgrade to secondary standards. Although specific data has not been collected to demonstrate this, improvements are dramatically evident through the increase in fish populations and recreational uses on many streams.

Significant pollution abatement operating costs are also annually incurred by the various chemical and manufacturing industries in the State, according to an August 1989 report prepared by the Chemical Manufacturers Association. This report, based on 1985 and 1986 data, indicates the chemical industry invested $53 million in 1986 in water pollution abatement costs. On a national comparison, West Virginia's chemical industries ranked fifth among states in such costs. This same report indicates the State's manufacturers spent $61 million in 1986 on water pollution abatement costs. This resulted in the State's manufacturing industries being ranked number 21 in such

expenditures when compared nationally.

In West Virginia, the majority of water pollution control activities (permitting) are administered through various State agencies. The Division of Natural Resources (DNR), Water Resources Section, oversees the administration and enforcement of water pollution control (NPDES) permits not related to coal mining. Coal related permits are handled by the Division of Energy (DOE). The Waste Management Section of DNR issues NPDES permits associated with solid waste facilities. Section 401 (Water Quality Certification) permits are administered by the DNR's Office of Environmental and Regulatory Affairs. Both the Water Resources and Wildlife Resources Sections of DNR review and provide comments on such permit applications. The State Health Department has input on municipal facilities and oversees all activities associated with home septic systems in cooperation with county sanitarians. The State Water Resources Board establishes water quality standards and acts as an appellate board on some water pollution control activities. The Water Resources Section 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). The appropriate costs of these activities for each agency is as follows:

Division of Natural Resources	
Water Resources Section (State + Federal)	$6,025,651
Wildlife Resources Section (approximation)	$ 110,000
Waste Management Section	$4,500,000
Office of Environmental & Regulatory Affairs	$ 222,000
Division of Energy	$ 801,000
Department of Health (Includes County Sanitarians)	$2,000,000
Water Resources Board	$ 121,000

Benefits have been realized from these measures taken on water quality maintenance or improvement. Water quality has improved in many of the State's rivers and streams, particularly the larger rivers (Ohio, Kanawha, and Monongahela). This is evidenced by a recovery of the sport fishery in these rivers, which in turn has resulted in an increase in other water-based recreational activities (e.g., boating, skiing, and swimming). While dollar figures pertaining to such activities are not available, obviously benefits are being realized not only in the form of money spent toward such recreation, but also in the actual public enjoyment of these recreational activities.

The Division of Natural Resources, Wildlife Resources Section has recently released a report on the economic impact of hunting and fishing in West Virginia. This report is based on a 1985 study conducted by the U.S. Fish and Wildlife Service and the U.S. Bureau of the Census. The report indicates that in 1985, residents and non-residents spent over $113,500,000 in West Virginia for fishing. These expenditures were for items such as food, lodging, transportation, fishing equipment, etc. Additionally, these recreational activities support employment in the State. West Virginia also receives approximately $12

WV DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER RESOURCES
FISCAL YEAR BUDGET COMPARISON
STATE FUNDS**

	Fiscal Year 1981-82		Fiscal Year 1982-83		Fiscal Year 1983-84		Fiscal Year 1984-85		Fiscal Year 1985-86	
	Appropriated	Actual*	Appropriated	Actual*	Appropriated	Actual*	Appropriated§	Actual*	Appropriated	Actual*
Positions	102	Same	103	89	91.5	91.5	91.5 plus 7 = 98.5		114	Same
Personal Services	1,707,792	Same	1,794,444	1,704,199	1,586,752	1,570,894	1,710,227 plus 160,000 = 1,870,227	Same	2,256,796	Same
Current Expense	532,927	Same	705,963	623,463	703,733	626,286	693,740 plus 40,00 = 733,740	Same	763,740	Same
Repairs & Alterations	8,779	Same	57,890	47,766	47,400	47,400	47,400	Same	47,400	Same
Equipment	0	Same	49,500	30,800	49,500	49,500	44,500	Same	44,500	Same
Potomac River Basin Comm.	12,450	Same	30,350	30,350	30,350	30,350	19,600	Same	20,300	Same
Ohio River Valley San. Comm.	64,520	Same	64,920	64,920	64,920	64,920	70,490	Same	70,490	Same
Ohio River Basin Comm.	21,000	Same	0	0	0	0	0	0	0	0
Black Fly Control										
Water Quality Studies										
Employee Benefits										
TOTAL APPROPRIATED	2,347,868		2,703,067		2,482,655		2,585,957 plus 200,000 = 2,785,957		3,203,226	
TOTAL ACTUAL		2,347,868@		2,501,498@		2,389,350@		Same@		3,203,226@
	*5% DNR expenditure reduction ordered 1-13-82		*3% expenditure reduction ordered 11-18-82, 7% additional expenditure reduction ordered 1-5-83		*1% expenditure reduction ordered for jobs program, 3% additional expenditure reduction ordered 7-15-83		*Executive order 1-85 restricts expenditures to ordinary and customary costs (essential services)		@Inc. $592,821 for GW/HW (29 positions - includes 1 chemist, Guthrie, 1 PIO Emp.) Included 239,025 for Solid Waste (11 pos.)	
							§Included 7 positions and $200,000 for Hazardous Waste Management ($160,000 Personal Services and $40,000 Current Expenses)			
	@Included 0 State Funds for GW/HW		@Included 0 State Funds for GW/HW		@Included 0 State Funds for GW/HW		@Included $117,366 for Solid Waste Program (5 positions)		Dam Control Program trans. from DOE to DNR/No funds provided	
			@100,000 of NPDES State funds were trans. to Solid Waste Program (4 positions)		@Included $87,456 for Solid Waste Program (4 positions)					

January, 1990
** (Excluding Water Resources Board)

Fiscal Year 1986-87		Fiscal Year 1987-88		Fiscal Year 1988-89		Fiscal Year 1989-90	
Appropriated	Actual*	Appropriated	Actual*	Appropriated	Actual*	Appropriated	Actual*
103	101	63	62 (54 F/T & 8 P/T)	68	68	57	53
2,317,257	2,135,549	1,310,729	1,284,691.40	1,437,999	1,364,875.34	1,307,780	1,239,686.86
680,086	606,623	492,964	492,963.60	442,962	417,051.36	446,674	446,674.00
45,108	45,108	39,608	39,608	39,608	26,108.00	37,068	37,068.00
38,161	38,161	2,000	2,000	2,000	2,000.00	6,105	6,105.00
20,300	20,300	20,300	20,300	24,400	24,400.00	25,620	25,620.00
70,490	70,490	56,681	56,681	100,200	100,169.00	85,725	85,725.00
0	0	0	0	0	0	0	0
				100,000	95,621.04	230,000	200,748.00
				50,000	50,000.00		
						358,611	339,690.08
3,171,396@		1,922,282		2,197,169	2,080,224.74@	2,497,583	2,381,316.94@
@	2,916,231@@		1,896,244@				

*5% expenditure reduction ordered 4-2-87; $42,762 Personal Services transferred to DCPA.

@Inc. 584,183 for Div. of Waste Mgmt. (25 positions)

@@Inc. $516,969 for Div. of Waste Mgmt.

@@$87,311.60 of NPDES State Funds transferred to Dam Control Program (3 positions)

@$26,038 Personal Services transferred to PIO
@Included $101,279 for Dam Control Program (4 positions)

*5% expenditure reduction ordered 1-19-89

Early retirements resulted in transfer of $7,085.81 and 1.5 positions

@Began paying Social Security match 1-1-89 ($46,814.58 cost)

Included $99,071 for Dam Control Program (4 positions)

*$32,568.26 and 2 positions transferred to Division of Personnel

3% expenditure reduction ordered 11-13-89 (Water Resources share: $29,252 Black Fly plus $54,445.80/ 2 positions

@Included $134,882.40 for Dam Control Program (4 positions)

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER RESOURCES*
FISCAL YEAR - BUDGET COMPARISON
FEDERAL FUNDS

	FY 81-82	FY 82-83	FY 83-84	FY 84-85	FY 85-86	FY 86-87	FY 87-88	FY 88-89
WR Council	127,808	-0-	-0-	-0-	-0-	-0-	-0-	-0-
106 & Special Studies	823,481	710,742	690,000	735,750	738,334	705,689	795,167	836,885
104(b)	-0-	-0-	-0-	-0-	-0-	76,558	-0-	-0-
208	611,282	275,472	-0-	-0-	-0-	-0-	-0-	-0-
UIC	330,947	239,176	310,850	400,821	276,806	194,209	269,448	179,401
205g	1,109,911	1,203,669	1,130,830	1,200,837	1,210,950	1,210,950	1,105,608	1,580,962
205g0	813,776	663,037	900,000	840,000	583,776	601,661	601,661	-0-
Ground Water 106-S	-0-	-0-	-0-	-0-	195,702	164,943	115,061	128,470
205j(5)	-0-	-0-	-0-	-0-	-0-	-0-	290,470	251,156
205j(1)	-0-	250,378	543,837	595,942	519,800	452,798	462,043	525,702
Clean Lakes	-0-	-0-	-0-	-0-	-0-	-0-	-0-	99,759
CL-Mountwood	-0-	-0-	-0-	-0-	-0-	-0-	-0-	42,000
SUB TOTAL	3,817,205	3,342,474	3,575,517	3,773,350	3,525,368	3,406,808	3,639,458	3,644,335
RCRA	705,687	674,456	700,018	898,906	706,000	*		
MSCA(CERCLA)	-0-	-0-	-0-	-0-	109,939	*		
DWR TOTAL	4,522,892	4,016,930	4,275,535	4,672,256	4,341,307			

*Division of Waste Management Created and Funds Transferred

million in revenues related to fishing activities. These revenues are generated by sales tax, license sales, federal reimbursements (excise taxes on fishing equipment) and income tax. 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.

Monitoring data are used to support permitting, enforcement and planning activities of the agency. Specifically, identifying and determining the degree of impairment of waters not fully supporting designated uses, limited by toxic substances, and/or not achieving water quality standards are the major goals of the monitoring program.

Over the past several years, the monitoring program (Monitoring Branch) in the Water Resources Section has employed a staff averaging 13 individuals. The Monitoring Branch, however, was recently eliminated as part of an agency-wide reorganization. The Office of Environmental Enforcement (OEE) was created to oversee all enforcement related water pollution control activities, including complaint investigation, spill response, and compliance monitoring of NPDES dischargers. General monitoring activities (ambient and mini-ambient networks, biological network, fish tissue sampling, groundwater characterization, lakes assessment, and intensive surveys) are all coordinated by individual programs within the newly created Program Management/Technical Support Branch. Individual programs within this Branch include Nonpoint Source, Groundwater, Biology, Laboratory, Quality Assurance, and Technical Support.

Following is a summary of the monitoring activities conducted by the Section. 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, Kanawha, Shenandoah and Potomac Rivers during this reporting period.

Ambient Water Quality Monitoring

Ambient water quality continued to be monitored monthly at 27 fixed sites (Table V-2) across the State during the report period. The information gathered is useful in assessing long-term trends and measuring differences between upstream and downstream stations on several rivers. Chemical constituents which are indicative of problems associated with sewage,

Table V-2
Sample Locations
Ambient Water Quality Network
(Page 1 of 2)

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 US Rt. 19 bridge in Star City (midstream)
MC-32	Cheat River at WV Rt. 26 bridge, Albright (midstream)
MC-79	Cheat R. at Tucker Co. Rt. 1 bridge below Parsons (midstream)

Table V-2 continued

WV CODE	DESCRIPTION
MT-006	Tygart Valley River, Rt. 62 bridge, Colfax (Midstream)
MT-091	Tygart Valley River at US Rts. 219 and 250 bridge above Beverly (midstream)
MW-12	West Fk. R. at Harrison Co. Rt. 19/2 bridge off US 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 US 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

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

Table V-2 continued

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	COD
Sulfates	TKN
Conductivity	(NO2 + NO3)-N
pH	Total Phosphorus
Iron	

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 six 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 are currently included in this program. OEE personnel in four of the six DNR administrative districts collect samples from 5 stations in each district. 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 which is extremely valuable for use in the preparation of this report.

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 DNR to make comprehensive evaluations on many of the State's waters. This biological information is entered into EPA's BIOS data system for manipulation. A ten-year trend analysis is currently being prepared utilizing this data.

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. Seventeen benthic surveys were conducted during the two-year report period. The majority of this work was done in support of NPDES permit issuance.

Water Resources Section personnel continued to support the DNR's efforts to survey and inventory the State's freshwater mussel populations. Since mussel species vary in their tolerance to poor water quality and since they are not mobile, they serve as excellent long-term indicators for water quality evaluations. In 1990 Water Resources personnel participated in an intensive effort to relocate mussels on the upper Kanawha River in order to minimize impacts from a barge loading/fleeting facility to be constructed in this area. This project and its associated 404 permit have been temporarily suspended due to the discovery of the federally endangered pink mucket (Lampsilis abrupta = L. orbiculata) during relocation efforts. Additional survey work was conducted below Kanawha Falls in 1991. Four more specimens of Lampsilis abrupta were found.

Table V-3
MACROINVERTEBRATE SAMPLING STATIONS
WV DNR, WATER RESOURCES SECTION

BASIN/ WV CODE	STATION LOCATION
OHIO RIVER	
0-233	Ohio River at Newell, WV
0-232	Ohio River at Pike Island Locks & Dam (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
0G-003	Guyandotte River at Huntington
0G-034	Guyandotte River at Branchland, WV
0G-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
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-3 continued

BASIN/ WV CODE OHIO RIVER	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
PNB-076-06	Stony River near Mt. Storm, WV
BIG SANDY RIVER	
BST-000	Tug Fork River at Fort Gay, WV

*Phytoplankton samples also collected at site

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 being considered for listing as endangered 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.

Section personnel assisted the U. S. Fish and Wildlife Service in an investigation of a mussel bed die-back in the Ohio River at Muskingum Island which apparently occurred in either 1990 or 1991. Thus far, not conclusions have been drawn. Water Resources personnel also assisted the Law Enforcement Section with evidence identification in an Ohio River mussel thievery case. Legal action is proceeding. From October 1989 through September 1990, personnel from the District 4 Field Operations Branch (now with the Office of Environmental Enforcement) collected monthly water quality data from the South Fork of Potts Creek at a site which is home to the endangered James Spinymussel (Pleurobema collina). The data and excerpts from the 1989-90 Ambient Water Quality Mini-network report have been forwarded to the U.S. Fish and Wildlife Service endangered species coordinator for West Virginia.

Intensive Surveys/Special Studies

Sampling of select tributaries to the New River within the boundaries of the New River Gorge National River continued during the report period. Various parameters associated with mine drainage as well as other conventional pollutants were evaluated from 18 tributary sites. Many of the streams sampled were found to be poorly buffered with very low alkalinity. Four of the 18 streams sampled reflected inpacts from mine drainage. The sampling was the last work performed by the Water Resources Section under contract to the National Park Service (NPS). This survey information has been entered into the Waterbody System and utilized in the preparation of this report. Upon the advice of the Section, the NPS contracted another party to compile a list of all water quality related reports and data available on streams within its jurisdiction in West Virginia. The list is available from the NPS office in Glen Jean, West Virginia.

During the report period, the East and West Forks of Greenbrier River and the Greenbrier River mainstem were monitored to determine impacts from the Howes Leather tannery at Frank in Pocahontas County. At one time, frequent fish kills from toxic discharges affected the East Fork and several miles of the Greenbrier mainstem. Now, toxic discharges are very infrequent. The institution of real time water quality management which matches discharge volume to stream flow has had a positive effect on the water quality of these streams. However, monitoring data indicates that contaminated groundwater may be contributing phenolic materials and other contaminants to East Fork so that it still may not support all of its designated uses. The improvements that have been achieved in environmental quality are a result of the combined efforts of the industrial community and

State and Federal regulatory authorities. Frequent fish kills and dissolved oxygen depletion appear to be things of the past; the river currently supports a diverse community of game fish, maintains acceptable water quality, and is a major recreational resource for boaters and fishermen.

Monitoring of Stony River in Grant County continued through the reporting period. At one time, this stream supported trout, but was degraded by warmwater discharges from a power plant and from coal mining influences in the watershed. Improvements in the early 1980's led to the stocking and support of trout and smallmouth bass in the lower 17 miles (VEPCO dam to mouth) of the river. However, declining conditions were noted in 1986 sampling at the Rt. 50 bridge (6 miles above mouth). The sampling yielded no benthic organisms and a thick gray precipitate blanketed the streambed. Results from a 1987 survey and subsequent monthly monitoring indicate that improper operation of Island Creek Coal Corporation's Laural Run mine located on Fourmile Run, was responsible for the most recent water quality degradation in the system. This survey work has been utilized in the WBS. A follow-up benthic survey has also been conducted by Island Creek Coal Company on this impacted area, but the report issued by the Company's contract lab was judged inadequate by Section biologists and inspectors. Even though benthic numbers and species diversity indicated the company's discharges negatively impacted Stony River, the contract lab concluded that the discharges had no impact. No benthic surveys have been conducted since 1988 by either the Section or the company, but observations by the Inspector who conducts the monthly sampling indicates that fish and benthos have returned to Stony River at the site 6 miles upstream from its mouth. Island Creek Coal Corporation has made an effort to improve its operations at the mine, but the State Division of Energy continues to permit the addition of toxic materials to the leaking gob pile at the site.

Monitoring Related Activities

Toxicity testing efforts continued throughout the reporting period. This work is generally conducted in conjunction with compliance sampling inspections. Approximately 100 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. Most of the tests subject the organisms to a 48-hour exposure period.

Performance audit inspections have been 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 the tests according to standard EPA protocols. Four laboratories were audited. Three of these were in close compliance with EPA procedures. The remaining laboratory would require extensive modification to produce reliable toxicity test results.

The analytical and data tracking capabilities relating to monitoring activities were expanded considerably during the report period. Tracking of NPDES inspections and effluent toxicity results, along with numerical data management of

specific chemical and biological analyses, represent major uses of the ISSD mainframe system.

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 may also 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 solely address this problem due to the magnitude of the reclamation costs involved. Even more unfortunate is the fact that the federal agencies mandated to oversee abandoned mined lands (Office of Surface Mining, OSM) and water quality (Environmental Protection Agency, EPA) continue their reluctance to work together in addressing this problem.

Significant progress has been made, however, with the recent reauthorization of the Surface Mining Control and Reclamation Act (SMCRA). OSM is now making an effort to address water quality concerns by setting aside 10% of the annual AML grants for water quality improvement projects. The State feels that this is a step in the right direction, but is still not adequate to address the pervasive problem of water quality degradation from abandoned mine lands.

B. Lack of Domestic Sewage Treatment

The majority of the state has progressed in the establishment 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 which have very little waste assimilitive capacity.

The Section's Guyandotte River Basin Plan (1987) found that 86 (20%) 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%) of the streams surveyed (1986) were reported in violation of the fecal coliform standard. This data is corroborated by the ambient water quality data collected by the Section during this reporting period. The Guyandotte River at Huntington violated the fecal coliform standard in 83% of the samples collected. Likewise, the Tug Fork River at Fork Gay displayed a 75% 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 is also evident in other river basins in the state. One alarming example is presented in the ambient monitoring information from the West Fork River at Enterprise, which displayed fecal coliform violations in 96% (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%) include the Tygart Valley River above Beverly (48%), Coal River at Tornado (46%), Monongahela River below Morgantown (39%), and Kanawha River at Winfield Locks and Dam (38%).

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 is also apparently having an impact on water quality in the New River mainstem, as several mainstem sites were found to have frequent fecal coliform excursions.

This sewage contamination is expected to continue into the future due to the extremely depressed economy in certain areas of the State. The problem will also 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 in order to provide assistance for the construction of sewage treatment facilities. This loan program is administered by the Section'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 Section's current laboratory facilities are in critical need of funding. EPA is well aware of the inability of the Section'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 which 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 must also be considered, particularly in the karst geology present in this part of the State.

The Water Resources Section is continually confronted with questions regarding land use in the issuance of permits. Therefore, the Section 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. Unpermitted Wood Treatment Plants

West Virginia has an abundance of timberland within its boundaries. Naturally, one would expect the development of various types of wood processing facilities near this source. One such type of facility is wood treatment, which produces "treated lumber" often used for fencing, decks and other outdoor structures susceptible to weather and insect damage. The wood treatment process often employs combinations of various chemicals such as creosote, pentachlorophenol, copper, chromium and arsenic. There remain a number of operating facilities of this type in West Virginia which are not permitted by any regulatory authority. The Section is concerned about the current and/or potential impact these facilities may have on both surface and groundwater by way of runoff, leachate, spills, etc. In order to bring these operations under regulation and to protect the State's waters, the Section is putting a concerted effort on facilitating the permitting of such operations.

F. Sludge Management

Sludge management and disposal from municipal facilities is currently addressed by the Water Resources Section's 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 which 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 Section 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 the guidelines developed. Sewage sludge is a great additive for soils and an important 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 Water Resources Section 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.

G. Licensing of Hypdropower 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 resource 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, August) in 1989. While some fishery recommendations were accepted, in each instance FERC failed to adopt an approach which 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 report 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.

H. 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 currently monitors only 27 sites routinely as part of its ambient chemical monitoring network. This provides very limited coverage on a statewide basis, considering there are over 9,000 streams in West Virginia totalling over 32,000 miles. Stream and groundwater monitoring are crucial for gauging the effectiveness of the State's water

pollution control programs. The importance of an adequate monitoring program cannot be overemphasized.

I. 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 which 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 currently affecting the State's waters. The extent and impacts of this type of pollution have 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 first 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.

An active program addressing and correcting water quality problems from abandoned mines should be a top priority for implementation. Other important NPS problems which will require a concerted effort to address are erosion and sedimentation, agricultural runoff, and oil and gas impacts. 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 becoming a major problem in certain areas of the State, particularly the Potomac and Greenbrier River valleys, where a burgeoning poultry industry threatens both water quality and quantity. This particular problem should be addressed through NPS programs covered by the various state and federal agricultural and soil conservation agencies. Impacts from oil and gas exploration can be minimized with an effective permitting and enforcement program administered by the newly created State Office of Oil & Gas.

B. Boundary Waters

Boundary or interstate waters present difficult and somewhat unique problems for permit writers to address. Waters which 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 written based on a seven-day low flow, 10 year return frequency (7/Q/10) situation. Other states may also use this 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 overallocating 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 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 insure 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, fish consumption, etc. 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 report 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 currently 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 State Water Resources Board is considering adopting the use of flow based on a harmonic mean for future permitting of these carcinogens. The use of the harmonic mean (as opposed to the 7/Q/10 flow) is currently utilized by a number of states and gives long-term consideration for carcinogen exposure in water quality management.

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 implemention.

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 report period, water quality monitoring by the Section on Stony River indicates the continuance of impacts from both active and abandoned mining activities. 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. The Section 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 and in turn it 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 sterile. In addition, the Division of Energy continues to permit the company to add toxic mine spoil and coal processing wastes to the gob pile that is leaking acidic, metal laden water into Fourmile Run.

The Buckhannon River and tributaries have also been severely impacted by mining activities. Both the Buckhannon and Stony river watersheds are characterized by coal seams associated with geologic strata which 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 be given special attention toward addressing these impacts. This action would not only alleviate some immediate concerns, but would also 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 sampled 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 neglect by the mining companies responsible will result in rendering the two streams no longer suitable as trout fisheries. In fact, that point of degradation may already have been reached.

The and 1989-90 Mini-network data indicates that streams in north central West Virginia 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 Co.) 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: Nonpoint source, clean lakes, groundwater, ambient and mini-ambient, and biological. Increased funding should be made available to the State so that it 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 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, 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.

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