ORBES

PENNSYLVANIA BASELINE

Part 2 - Impact Assessment Data Base

Chapter 1 - Characteristics and Human Utilization of Natural Ecosystems

Section 6 - Water Quality

PHASE II

OHIO RIVER BASIN ENERGY STUDY

June 1979

PENNSYLVANIA BASELINE

Part 2 - Impact Assessment Data Base

Chapter 1 - Characteristics and Human Utilization of Natural Ecosystems

Section 6 - Water Quality

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2.1.6. WATER QUALITY

2.1.6.1. INTRODUCTION

"The acceptability of a water's quality must be defined by using the beneficial use's quality requirements as a reference point, because quality standards differ according to use. What may be 'good' quality water for industrial purposes may be 'poor' quality for drinking purposes, and vice versa. Accordingly, water pollution is the degradation of quality to a degree that interferes with desired uses.

"Water quality problems in the study area date back to the 1800's. Continual improvements in many areas, such as forestry management, industrial waste treatment, and programs to reduce or eliminate mine drainage, have upgraded the general environmental quality of the area. However, greater pollution control is necessary to meet the desired goals set forth by the Pennsylvania Clean Stream Laws: to prevent further pollution and to restore polluted streams to clean condition, and to meet the mandates and goals of P.L. 92-500, Federal Water Pollution Control Act Admendments of 1972.

"Not only surface waters but also ground waters become degraded. Ground water quality depends on many factors - climatic changes, mineral composition of rock and soil, rate of circulation, and man's activities, especially mining, waste disposal, and ground water pumping.

"Pollutant discharges may be either from point sources or non-point sources. Point source pollution can be traced to a single, definitive point of discharge. Non-point source pollution comes from a diffuse area. Point sources include wastewater from municipal, industrial, and mine drainage treatment facilities, combined sewer overflows, and others. Non-point sources include agricultural and urban runoff, surface mining runoff, construction site runoff, salt water intrusion, and on-lot sewage disposal.

"Industries in this area discharge their wastewaters into municipal systems or into surface waters. Because of their quality and quantity, as well as their location on multiple-use streams, industrial discharges are potential threats to surface water quality.

"Heaviest concentrations of industrial discharges are in Allegheny County where 150 facilities discharge wastes into streams. An additional 250 facilities discharge to ALCOSAN on the Ohio River. The most concentrated area is along the Monongahela with most discharges originating from steel plants."

These excerpts are from "COWAMP - Comprehensive Water Quality Management Plan" (1) which is the State baseline study and plan for the quality of the water resources of Pennsylvania. The COWAMP Study Areas #8 and #9 cover most of the ORBES region in Pennsylvania and areas #5 and #6 include the remainder. A map showing the overlap of COWAMP Study Areas and the ORBES region is given in Figure 2.1.6.-1.

The "Study Areas" were adopted in the State Water Plan as the basic organizational structure. There are 10 study areas in the state, each covering a fairly uniform geographical region but with boundaries conforming to existing county boundaries. There are 19 counties in the PA ORBES region which are situated in the four different COWAMP Study Areas as shown in Figure 2.1.6.-1 and listed in Table 2.1.6.-1.

TABLE 2.1.6.-1
ORBES COUNTIES IN COWAMP STUDY AREAS

COWAMP Study Area #5

- Cambria Co.
- Somerset Co.

COWAMP Study Area #6

- Clearfield Co.
- Elk Co. (eastern part)

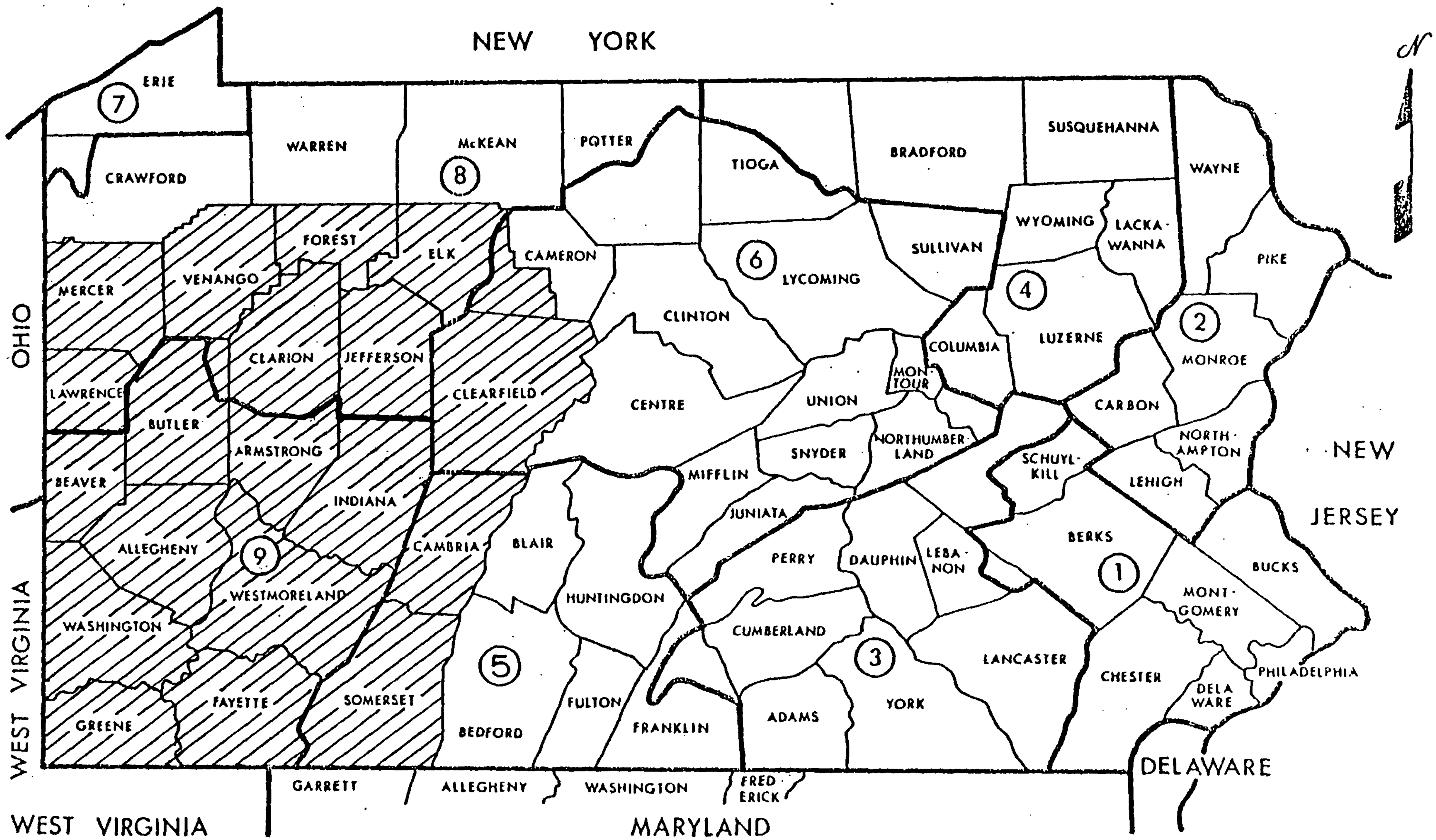
COWAMP Study Area #8

- Clarion Co.
- Elk Co. (western part)
- Forest Co.
- Jefferson Co.
- Lawrence Co.
- Mercer Co.
- Venango Co.

COWAMP Study Area #9

- Allegheny Co.
- Armstrong Co.
- Beaver Co.
- Butler Co.
- Fayette Co.
- Greene Co.
- Indiana Co.
- Washington Co.
- Westmoreland Co.

The basic planning units of the COWAMP studies, however, are the 20 sub-basins of the State numbered from 1 to 20. Each Sub-basin consists of a major watershed area, further subdivided into smaller watersheds designated by capital letters, such as 19A, 19B, 19C, etc. for Sub-basin 19.



LEGEND

- COWAMP STUDY AREA BOUNDARIES
- COUNTY BOUNDARIES
- (5) COWAMP STUDY AREAS - NUMBERED
- ORBES Region

FIGURE 2.1.6.-1

OVERLAP OF ORBES REGION WITH COWAMP STUDY AREAS AND COUNTIES

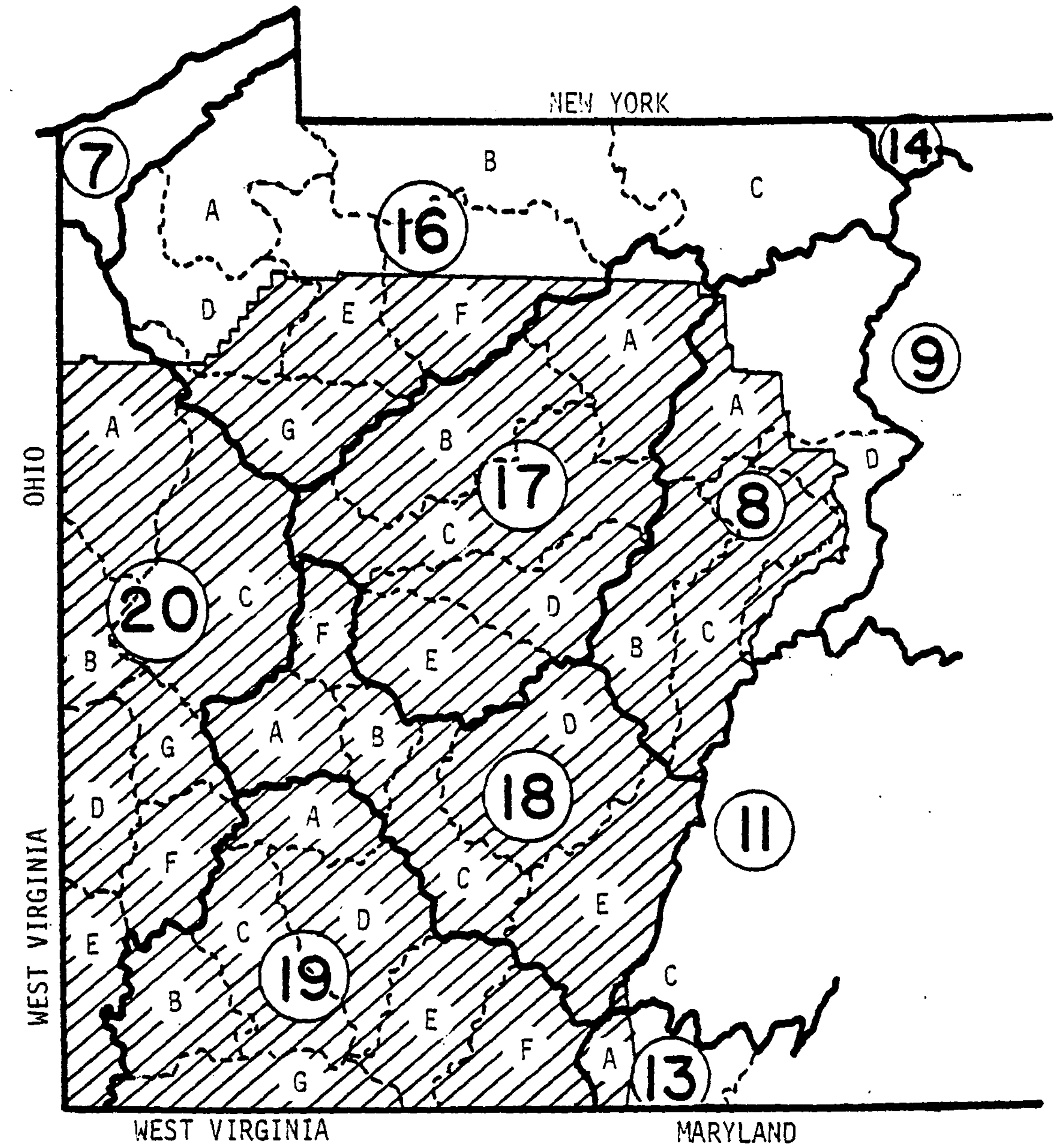
The PA ORBES region overlaps parts of eight sub-basins, as shown in Figure 2.1.6.-2:

- . Western part of Sub-basin 8 - Upper West Branch Susquehanna Sub-basin
- . Western-most tip of Sub-basin 11 - Upper Juniata Sub-basin
- . Western-most tip of Sub-basin 13 - Potomac Sub-basin
- . Southern part of Sub-basin 16 - Upper Allegheny Sub-basin
- . Sub-basin 17 - Central Allegheny (except its northern tip)
- . Sub-basin 18 - Lower Allegheny Sub-basin
- . Sub-basin 19 - Monongahela Sub-basin
- . Sub-basin 20 - Ohio Sub-basin (except its northern tip)

Much of the material in this chapter on baseline data for water quality in Pennsylvania is taken from the COWAMP reports (References 1,2,3,4) as it applies to the ORBES region. These reports contain a wealth of valuable information on many aspects of water use and quality in the ORBES Region, particularly large-size plates which accompany the various chapters. A list of the most pertinent plates in the COWAMP reports is given in Table 2.1.6.-2 for reference. The small portions of Sub-basins 8,11,and 13 which are included in the ORBES Region are actually not part of the Ohio River Basin and only limited amount of information will be presented for these areas in this report.

FIGURE 2.1.6.-2

OVERLAP OF ORBES REGION WITH COWAMP SUBBASINS



COWAMP SUB-BASINS IN ORBES REGION

8 Upper West Branch Susquehanna

11 Upper Juniata Sub-basin

13 Potomac Sub-basin

16 Upper Allegheny Sub-basin

17 Central Allegheny Sub-basin

18 Lower Allegheny Sub-basin

19 Monongahela Sub-basin

20 Ohio Sub-basin

LEGEND

COWAMP SUB-BASIN BOUNDARY

(8) COWAMP SUB-BASIN - NUMBERED

ORBES REGION BOUNDARY

ORBES REGION

LIST OF PERTINENT PLATES IN COWAMP REPORTS

COWAMP STUDY AREA #5 (3)

Plate	Title
IV-6	Selected Stream Gaging Stations
IV-9	Groundwater Degradation and Critical Recharge Areas
VI-1	Major Streams and Water Quality Sampling Points
VI-2	Existing Aquatic Environments
VI-3	Public and Industrial Water Use
VI-4	Domestic Ground Water Use
VI-5	Agricultural Water Use
VI-6	Recreational Water Use
VI-7	Water Based Power Generation
VI-8	Wastewater Treatment Facilities and Untreated Discharges
VI-9	Water Use Totals and Available Resources
VI-10	Water Resources Development Projects
VI-11	Documented Acid Mine Drainage Discharge Points
VI-12	Ground Water Quality Problem Areas
VI-13	Surface Water Quality Problem Areas
VI-14	Ground Water Sampling Points
VI-15	Ground Water Quality by Hydrogeological Group
VI-16	Elevated Chemical Parameters in Ground Water Sampling Points
VI-17	Stream Use Classifications
VI-18	Water Quality Criteria Classification
VI-19	Effluent Limitation Zones
VII-1	Wastewater Treatment Facilities and Untreated Discharges
VII-2	Coal Mining Areas
VII-3	Coal Operating Wastewater Treatment Facilities
VII-4	Existing and Presently Planned Sewered Areas
VII-5	Landfills, Unlined Lagoons, and Spray-Irrigation Sites

TABLE 2.1.6.-2 Continued

COWAMP STUDY AREA #6 (4)	
Plate	Title
IV-9	Potential Ground Water Yield
IV-10	Potential Ground Water Recharge Areas
VI-1	General Study Area Map
VI-2	Public Water Systems
VI-3	Non-Public Water Uses
VI-4	Existing Reservoir Development
VI-5	Potential Ground-Water Yields and Pumping Areas
VI-6	Surface Water Quality Monitoring
VI-7	Water Quality Problems
VII-1	Existing and Planned Municipal Wastewater Treatment Systems
VII-2	Existing Industrial and Non-Municipal Wastewater Treatment Facilities
VII-3	Active Coal Mine Locations
VII-4	Malfunctioning On-Lot Disposal Areas
VII-5	Existing and Planned Land Disposal Locations
COWAMP STUDY AREA #8 (1)	
IV-14	Ground Water Use
IV-15	Ground Water Availability
IV-18	Abandoned Deep Coal Mines
IV-19	Degraded Surface Waters
IV-20	Areas of Known or Potential Ground Water Degradation
VI-1	Hydrologic Basins
VI-2	Water Supply Treatment Facilities, Sources, and Service Areas

TABLE 2.1.6.-2 Continued

COWAMP STUDY AREA #8 (1)	
Plate	Title
VI-3	Ground Water Pumpage
VI-4	Stream Use Designations
VI-5	Water Quality Monitoring Points
VI-6	Surface Water Classification
VI-7	Location of United States Geological Survey - Ground Water Sampling Points
VII-1	Municipal and Non-municipal Wastewater Treatment Facilities
VII-2	Septic Tank Concentrations
VII-3	Industrial Wastewater Discharges
VII-4	Mine Drainage Treatment Facilities
VII-5	Solid Waste Sites
VII-6	Existing Monitoring Stations
COWAMP STUDY AREA #9 (2)	
IV-15	Ground Water Use
IV-16	Ground Water Availability
IV-23	Abandoned Deep Mines
IV-24	Degraded Surface Waters
IV-25	Areas of Known or Potential Ground Water Degradation
VI-1	Hydrologic Basins
VI-2	Water Supply Treatment Facilities, Sources, and Service Areas
VI-2a	High Detail - Water Supply Treatment Facilities and Sources
VI-3	Ground Water Pumpage

TABLE 2.1.6.-2 Continued

COWAMP STUDY AREA #9 (2)

Plate	Title
VI-4	Stream Use Designations
VI-5	Water Quality Monitoring Points
VI-6	Surface Water Classification
VI-7	Location of USGS Ground Water Sampling Points
VII-1	Municipal Wastewater Treatment Facilities
VII-2	Non-municipal Wastewater Treatment Facilities and Raw Discharges, and Municipal Raw Discharges
VII-3	Septic Tank Concentrations
VII-4	Industrial Wastewater Discharges and Spray Irrigation Facilities
VII-5	Industrial Wastewater Discharges
VII-6	Industrial Wastewater Discharges
VII-7	Deep Mine Drainage Treatment Facilities - Surface Mine Drainage Treatment Facilities
VII-8	Solid Waste Sites and Treatment Facilities
VII-9	Water Quality Monitoring Points

2.1.6.2. WATER QUALITY DATA SOURCES

Water quality data in the PA ORBES region are collected by several agencies. These include:

- PA Department of Environmental Resources
- PA Fish Commission
- PA Western Conservancy
- U.S. Environmental Protection Agency
- U.S. Geological Survey
- U.S. Department of Agriculture
- U.S. Coast Guard
- U.S. Army Corps of Engineers
- ORSANCO
- Pittsburgh Naval Reactors
- County Health Departments
- local water and wastewater treatment agencies
- conservation groups and watershed associations
- industries

Much of the sampling is irregular, conducted for a specific, temporary reason and provides only limited information for a short time period. There are a few major monitoring networks which will be described briefly below but many of the reports and publications from short-term studies will be used in the discussion.

The U.S. Geological Survey (USGS) is concerned with chemical and physical characteristics of the surface and ground water supplies of the Nation. Most of its investigations are carried out in cooperation with State, municipal, and other Federal agencies. USGS has published the records of chemical quality, temperature, and suspended sediment of surface waters from 1941 to 1970 in an annual series of water-supply papers entitled "Quality of Surface Waters of the United States". To meet interim requirements, for water years 1964 through 1974, water quality records have also been released by the USGS in annual reports for each state. For PA these reports are entitled "Water Resources Data for Pennsylvania, Part 2. - Water Quality Records". Beginning with the 1975 water year, data for streamflow, surface water quality, and ground water are published as an official" USGS Water-Data Report" on a State-boundary basis entitled "Water Resources Data for Pennsylvania - Water Year X".

USGS, in cooperation with the PA Bureau of Topographic and Geologic Survey of DER, has also been sampling and analyzing public, private, and industrial spring and well waters at various locations since about 1930. The results have been published by the PA Bureau of Topographic and Geologic Survey in ground water reports or bulletins of their W series.

The PA Department of Environmental Resources (DER) Bureau of Water Quality Management has collected and analyzed water quality samples throughout the state as part of the PA Water Quality Network (WQN) (5) since 1962. Beginning with the 1976 water year the results are included in the "Water Resources Data for Pennsylvania" published by USGS. At this time records of samples collected prior to October 1975 are available only through the DER but will be published in the future as a separate data report.

The data are also entered into computerized information retrieval networks: Pennsylvania's Water Quality Management Information System (WAMIS), and the U.S. Environmental Protection Agency's STORET. These data can be accessed by means of station's Water Quality Network number (PA-DER WQN No.) or the 8-digit downstream-order station number assigned by USGS (EPA/USGS No.). About 55 parameters are stored in STORET for each WQN station and these can be retrieved along with the dates on which the sampling took place or the mean, variance, standard deviation, maximum and minimum values of each parameter can be calculated for any time period and outputted along with the number of samples involved.

There are approximately 300 WQN stations in the state where samples are collected regularly, on a monthly or quarterly basis. Twenty-five chemical indicators are analyzed for each sample but biological monitoring has also been established at some of the stations. Heavy metal analysis is performed once a year during low flow conditions. There are also a number of partial record stations where samples are collected irregularly and only a few analyses are performed on the samples.

The Bureau of Water Quality Management also samples and analyses the raw water quality of all ground water sources prior to issuing a permit for public water supply use. After issuance of the permit, raw water samples are generally taken only when a problem arises or if treatment is not normally provided.

Other bureaus of DER perform less extensive monitoring, oriented toward their own need. Thus, the Bureau of Surface Mine Reclamation collects surface and ground water quality data affected by surface mining activities. The sampling begins prior to issuing a surface mining permit, continues throughout the activity and extends into the reclamation period. The Bureau of Community Environmental Control monitors the water quality of certain semi-public waters (State parks, restaurants, schools, institutions, public swimming and bathing places, etc) and the Bureau of Land Protection monitors the ground water at landfill sites, wastewater lagoons, and similar facilities. None of the data collected by these bureaus is fed into any computer system at the present time.

The Ohio River Valley Water Sanitation Commission (ORSANCO), an instrument of an eight-state compact, maintains a comprehensive water quality monitoring network on the Ohio River and the lower reaches of its major tributaries. It has more than 25 robot monitors in operation, six of which are in the PA-ORBES Region. The robots continuously monitor only four parameters (temperature, conductivity, dissolved oxygen, and pH) of which the daily averages are computer-calculated and these data are available on computer printouts (6). Samples at major stations are also collected manually on a bi-weekly basis and analyzed for 30 additional parameters, including heavy metals. Recent concern with discharges of toxic chemicals has caused a drastic change in the Commission's monitoring program to include organic substances, such as PCB's and pesticides in fish, river water, and sediment. A statistical summary of the robot monitor data and the results of some other water quality analyses are published monthly (7).

Table 2.1.6.-3 lists all surface water quality sampling stations operated by the above listed monitoring networks within the PA-ORBES Region. Included are seven ORSANCO stations (one of which has been discontinued), five EPA Primary Stations, and 86 WQN Stations (16 of which have recently been discontinued). The locations of these sampling stations are shown in Figures 2.1.6.-3 through 2.1.6.-7.

TABLE 2.1.6.-3 SURFACE WATER QUALITY SAMPLING LOCATIONS

PA-DER WQN NO.	STREAM	COWAMP SUB-BASIN	LOCATION	EPA/USGS NO
		MONONGAHELA RIVER BASIN		
(b)(c)	Monongahela River	19C	Charleroi, Washington Co.	
(b)	Monongahela River	19A	S. Pittsburgh, Allegheny Co.	
701 (a)	Monongahela River	19A	Braddock, Allegheny Co.	850
702	Monongahela River	19C	Charleroi, Washington Co.	750
703 (a)	Monongahela River	19G	Greensboro, Greene Co.	725.50
704	Turtle Creek	19A	Trafford, Westmoreland Co.	845
705	Abers Creek	19A	Plum Boro, Allegheny County	840
706	Youghiogheny River	19D	Sutersville, Westmoreland, Co.	835
707	Youghiogheny River	19D	Connellsville, Fayette Co.	825
708 (c)	Youghiogheny River	19E	Ohiopyle, Fayette Co.	815
709	Youghiogheny River	19F	Youghiogheny Dam, Somerset Co.	775
710	Casselman River	19F	Markleton, Somerset Co.	790
712	Redstone Creek	19C	Franklin Twp., Fayette Co.	745
713	South Fork Ten Mile Creek	19B	Jefferson, Greene Co.	730
714	Dunkard Creek	19G	Dunkard Twp., Greene Co.	720
715	Sewickley Creek	19D	Hunker, Westmoreland Co.	832.50
716(c)	South Fork Ten Mile Creek	19B	Clarksville, Greene Co.	735.35
717	Ten Mile Creek	19B	E. Bethlehem Twp., Washington Co.	736
718	Pigeon Creek	19C	Carroll Twp., Washington Co.	750.40
719	Peters Creek	19C	Jefferson Borough, Allegheny Co.	750.90
720(c)	Turtle Creek	19A	Franklin Twp., Westmoreland Co.	839.75
721	Jacobs Creek	19D	Scottsdale Boro, Westmoreland Co.	830.38
722(c)	Casselman River	19F	Harnedsville, Somerset Co.	792
723	Big Sandy Creek	19G	Wharton Twp., Fayette Co.	704
724	Laurel Hill Creek	19E	Confluence, Somerset Co.	800
725	Monongahela River	19G	Point Marion, Fayette Co.	630

TABLE 2.1.6.-3(Continued)

PA-DER WQN NO.	STREAM	COWAMP SUB-BASIN	LOCATION	EPA/USGS NO.
		UPPER ALLEGHENY RIVER BASIN		
804(a.)	Allegheny River	16G	Franklin, Venango Co.	255
805	Allegheny River	16F	Harmony Twp., Forest Co.	160
826	French Creek	16D	Utica, Venango Co.	240
828(c)	Oil Creek	16F	Rouseville, Venango Co.	205
829	Tionesta Creek	16F	Tionesta Twp., Forest Co.	200.50
830	Tionesta Creek	16F	Howe Twp., Forest Co.	175
845	French Creek	16D	Franklin, Venango Co.	254.90
848(c)	Lake Creek	16D	Jackson, Twp., Venango Co.	242.30
852	Oil Creek	16E	Oil City, Venango Co.	210.50
853(c)	Tionesta Creek	16F	Tionesta Twp. Forest Co.	200.05
		MIDDLE ALLEGHENY RIVER BASIN		
802	Allegheny River	17E	Kittanning Twp., Armstrong Co.	365
803	Allegheny River	17C	Hovey Twp., Armstrong Co.	315
818	Crooked Creek	17E	Bethel Twp., Armstrong Co.	390.10
819	Mahoning Creek	17D	Redbank Twp., Armstrong Co.	360
820	Redbank Creek	17C	Porter Twp., Clarion Co.	325
821	Clarion River	17B	Piney Twp., Clarion Co.	305.15
822	Clarion River	17B	Farmington Twp. Clarion Co.	295.
823	Clarion River	17A	Johnsonburg, Elk Co.	285
824	W. Branch Clarion River	17A	Jones Twp., Elk Co.	280
825	E. Branch Clarion River	17A	Jones Twp., Elk. Co.	275.45
833	Clarion River	17A	Ridgway, Elk Co.	290
835(c)	Mahoning Creek	17D	Punxsutawney, Jefferson Co.	340
836(c)	Little Mahoning Creek	17D	McCormic, Indiana Co.	345
837(c)	Crooked Creek	17E	South Bend Twp., Armstrong Co.	380
841	Cowanshannock Creek	17E	Valley Twp., Armstrong Co.	364
842(c)	Mahoning Creek	17D	Pine Twp., Armstrong Co.	361
843	Clarion River	17B	Richaland Twp., Clarion Co.	310

TABLE 2.1.6.-3 (Continued)

PA-DER WQN NO.	STREAM	COWAMP SUB BASIN	LOCATION	EPA/USGS NO.
			MIDDLE ALLEGHENY RIVER BASIN (continued)	
844	Elk Creek	17A	Ridgway, Elk Co.	289
859	Little Toby Creek	17A	Portland Mills, Elk Co.	291.70
			LOWER ALLEGHENY RIVER BASIN	
(b)	Allegheny River	18A	Oakmont, Allegheny Co.	
(b)	Allegheny River	18F	Lock &Dam No. 5, Armstrong Co.	
(b)	Kiskiminetas River	18B	Vandergrift, Westmoreland Co.	
801(a)	Allegheny River	18A	New Kensington, Westmoreland Co.	496.25
808	Buffalo Creek	18F	S. Buffalo Twp., Armstrong Co.	489
809	Kiskiminetas River	18B	Vandergrift, Westmoreland Co.	485
810	Conemaugh River	18C	Conemaugh Twp., Indiana Co.	440
811	Conemaugh River	18D	Seward, Westmoreland Co.	415
812	Loyalhanna Creek	18C	Loyalhanna Twp., Westmoreland Co.	470
813	Loyalhanna Creek	18C	Unity Twp., Westmoreland Co.	449.97
814	Black Lick Creek	18D	Burrell Twp., Indiana Co.	420
815	Two Lick Creek	18D	Center Twp., Indiana Co.	425.05
816	Little Conemaugh River	18E	Franklin, Cambria Co.	410.25
817	Stony Creek	18E	Ferndale, Cambria Co.	400
838	Pine Creek	18A	Hampton Twp., Allegheny Co.	497.50
839	Deer Creek	18A	West Deer Twp., Allegheny Co.	496.45
840(c)	Buffalo Creek	18F	Clearfield Twp., Butler Co.	488.50

TABLE 2.1.6.-3.(Continued)

PA-DER WQN NO.	STREAM	COWAMP SUB BASIN	LOCATION	EPA/USGS NO.
			OHIO RIVER BASIN	
(b)	Ohio River	20G	S. Heights, Beaver Co.	
(b)	Beaver River	20B	Beaver Falls, Beaver Co.	
901	Ohio River	20D	East Liverpool, Ohio	1096.50
902	Ohio River	20G	Sewickley, Allegheny Co.	860
903	Raccoon Creek	20D	Center Twp., Beaver Co.	1080
904	Beaver River	20B	Rochester, Beaver Co.	1076.15
905(a)	Beaver River	20B	Eastvale, Beaver Co.	1075
906	Beaver River	20B	Wampum, Lawrence Co.	1055
907	Connoquenessing Creek	20C	Franklin Twp., Beaver Co.	1060
908	Slippery Rock Creek	20C	Perry Twp., Lawrence Co.	1065
909	Shenango River	20A	New Castle, Lawrence Co.	1045
910	Shenango River	20A	Sharpsville, Mercer Co.	1035
912(c)	Pymatuning Creek	20A	So. Pymatuning Twp., Mercer Co.	1025
913	L. Shenango River	20A	Hempfield Twp., Mercer Co.	
914	Chartiers Creek	20F	Carnegie, Allegheny Co.	855
915	Mahoning River	20B	Mahoning Twp., Lawrence Co.	996
916	Chartiers Creek	20F	Peters Twp., Washington Co.	852.60
917	Connoquenessing Creek	20C	Penn Twp., Butler Co.	1058.10
918	Two Mile Run	20B	Borough Twp., Beaver Co.	1076.20
919(c)	Brush Creek	20C	Marion Twp., Beaver Co.	1060.18
920	Glade Run	20C	Forward Twp., Butler Co.	1058.50
921	Slippery Rock Creek	20C	Worth Twp., Butler Co.	1061.53
922	Slippery Rock Creek	20C	Perry Twp., Lawrence Co.	1065
923	N. Fork L. Beaver Creek	20B	L. Beaver Twp., Lawrence Co.	1093.90
924(c)	Big Run	20A	New Castle, Lawrence Co.	1052.48
926	Slippery Rock Creek	20C	Marion Twp., Butler Co.	1060.30

TABLE 2.1.6.-3 (Continued)

PA-DER WQN NO.	STREAM	COWAMP SUB-BASIN	LOCATION	EPA/USGS NO.
	UPPER WEST BRANCH SUSQUEHANNA BASIN (d)			
404	West Branch Susquehanna River	8D	Karthaus, Clearfield Co.	5425
405	West Branch Susquehanna River	8B	Curwensville Reservoir Dam, Clearfield Co.	5412
406	West Branch Susequehanna River	8B	Bower, Clearfield Co.	5410
422	Clearfield Creek	8C	Clearfield, Clearfield Co.	5415.50
436	Chest Creek	8B	Mahaffey, Clearfield Co.	5408.23
438	Alder Run	8C	Kylertown, Clearfield Co.	5418
440	Anderson Creek	8B	Curwensville, Clearfield Co.	5412.48

NOTES: (a) EPA Primary Station

(b) ORSANCO Station

(c) Discontinued

(d) Not in the Ohio River Watershed

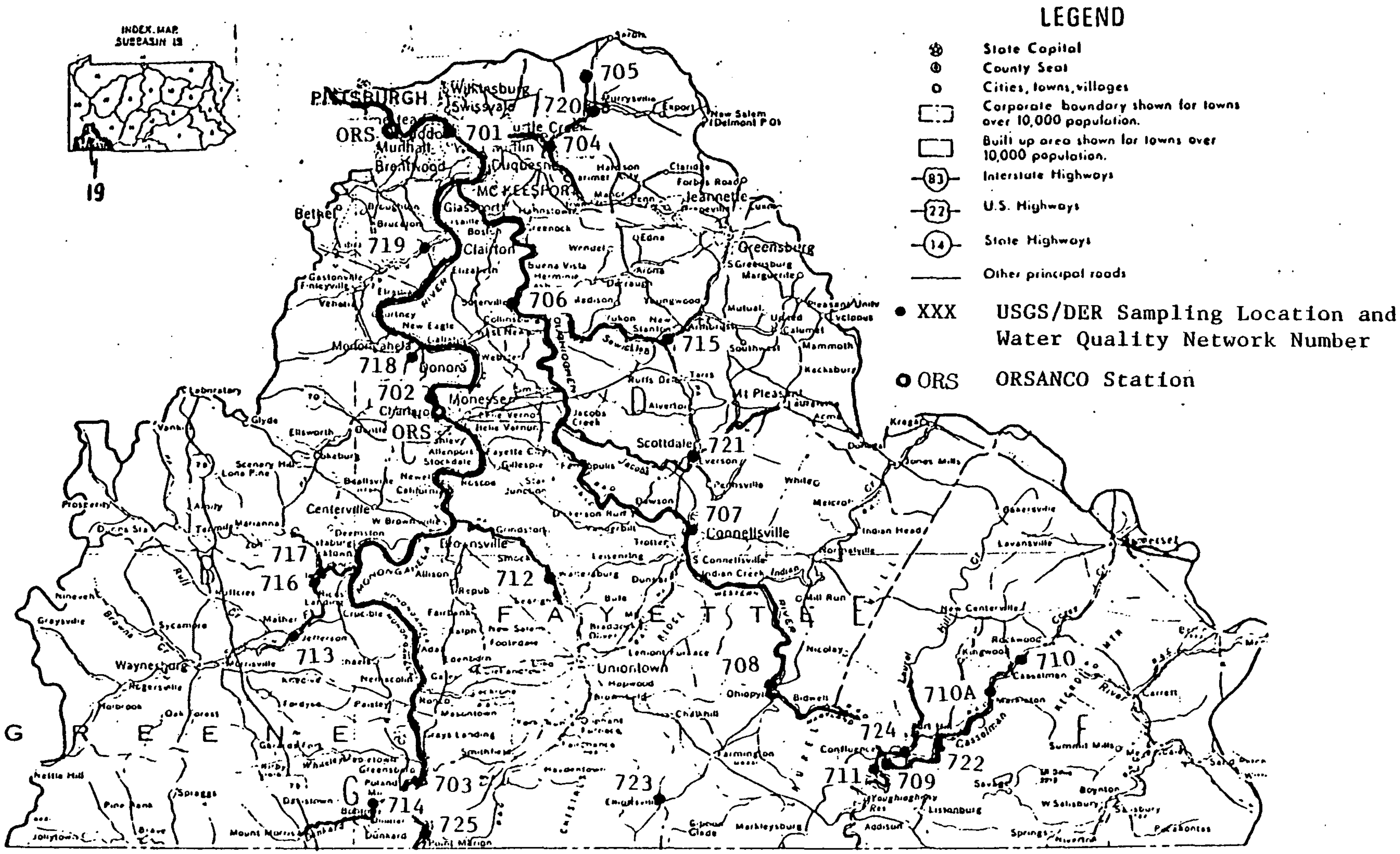


FIGURE 2.1.6.-3 SURFACE WATER QUALITY SAMPLING LOCATIONS -- MONONGAHELA RIVER BASIN

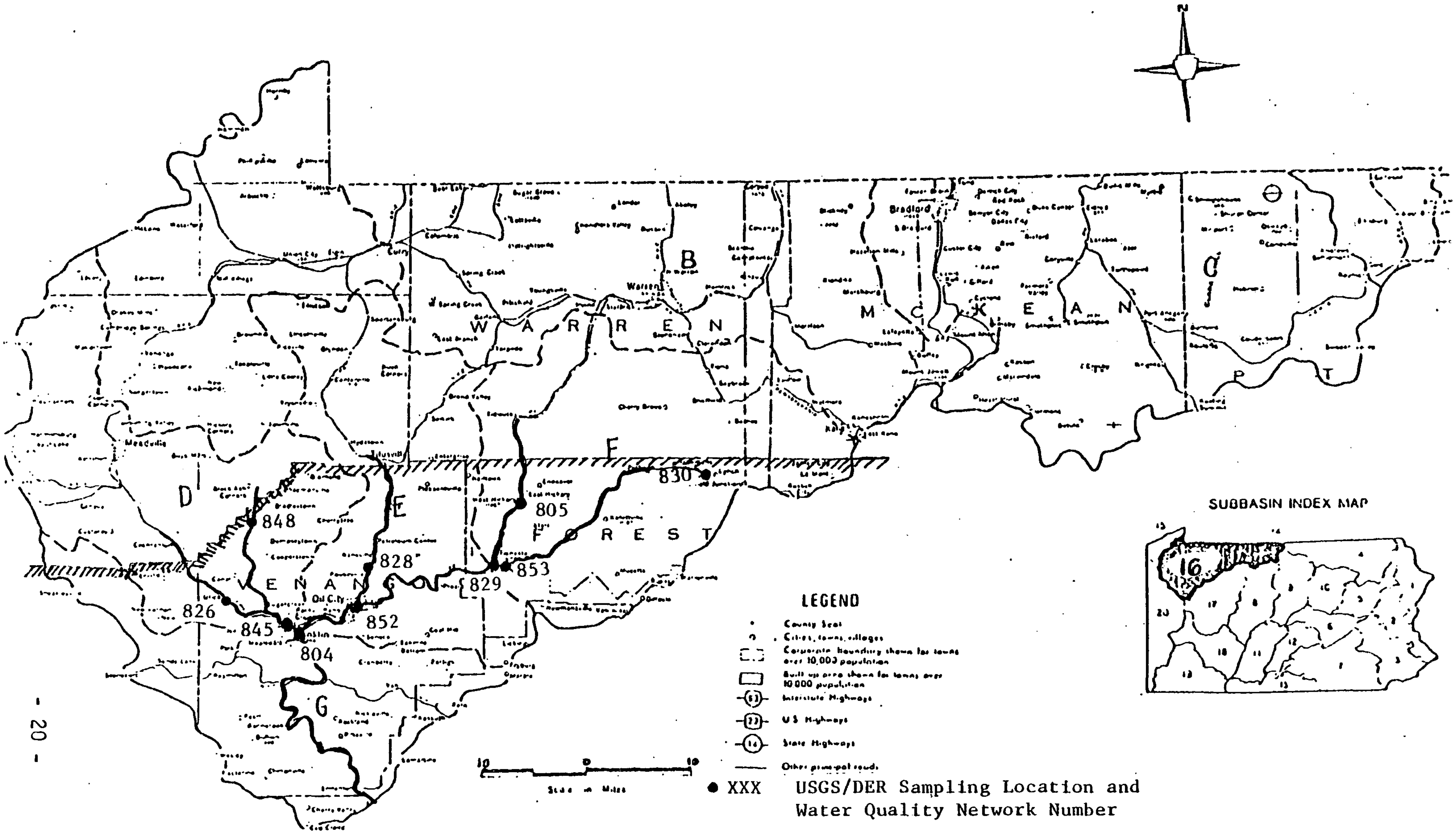


FIGURE 2.1.6-4 SURFACE WATER QUALITY SAMPLING LOCATIONS -- UPPER ALLEGHENY RIVER BASIN

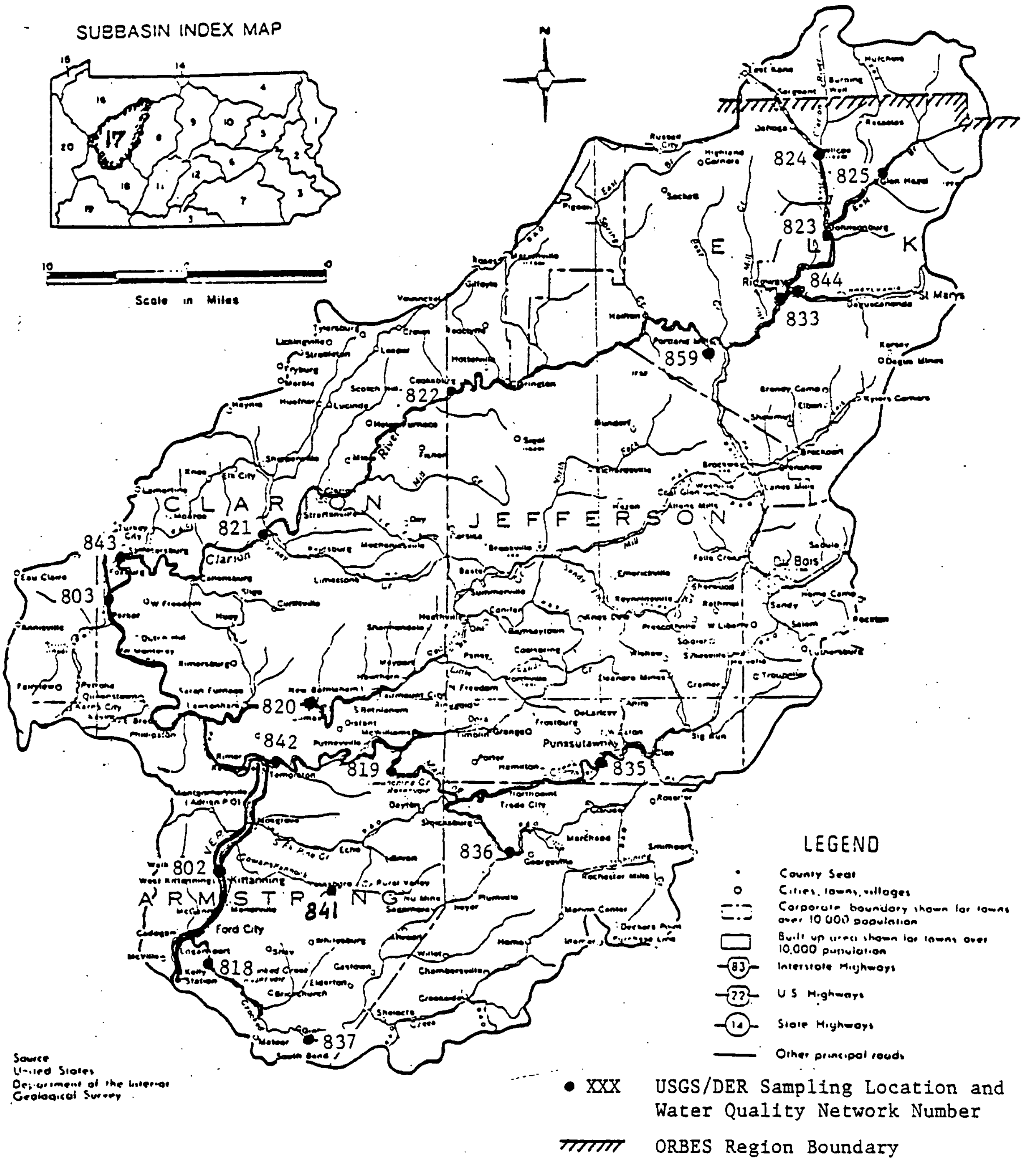


FIGURE 2.1.6.-5 SURFACE WATER QUALITY SAMPLING LOCATIONS
MIDDLE ALLEGHENY RIVER BASIN

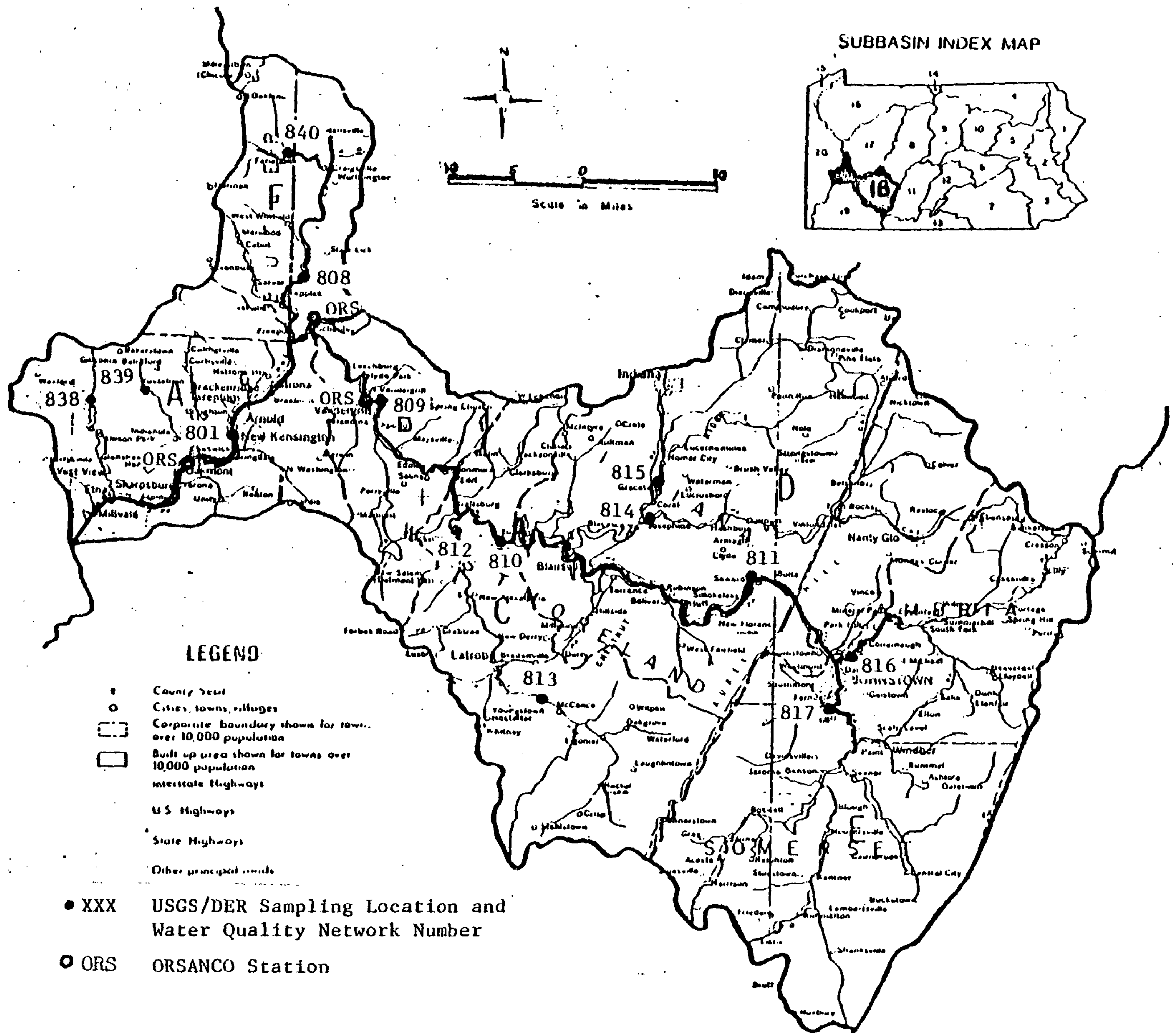


FIGURE 2.1.6.-6 SURFACE WATER QUALITY SAMPLING LOCATIONS -- LOWER ALLEGHENY RIVER BASIN

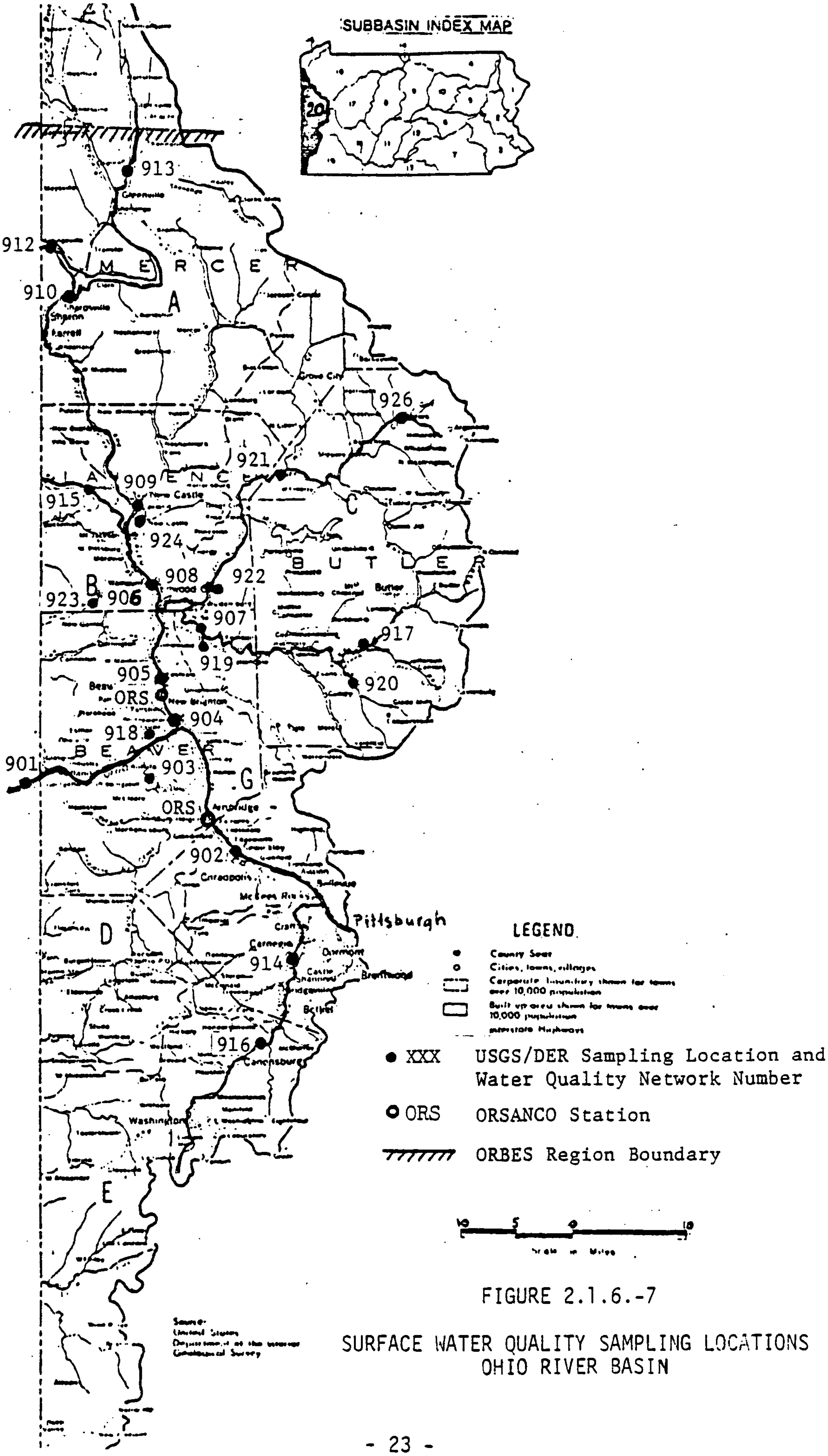


FIGURE 2.1.6.-7

SURFACE WATER QUALITY SAMPLING LOCATIONS
OHIO RIVER BASIN

2.1.6.3. WATER QUALITY CONTROL AND STANDARDS

A. Federal Control

On October 18, 1972, the Congress, over a presidential veto, enacted Public Law 92-500, the Federal Water Pollution Control Act Amendments of 1972. Responding to public demand for cleaner water, the law it enacted culminated two years of intense debate, ... and resulted in the most assertive step in the history of national water pollution control activities...
The Act, P.L. 92-500, departed in several ways from previous water pollution control legislation. It expanded the Federal role in water pollution control, increased the level of Federal funding for construction of publicly owned waste treatment works, elevated planning to a new level of significance, opened new avenues for public participation and created a regulatory mechanism requiring uniform technology-based effluent standards together with a national permit system for all point source dischargers as the means of enforcement...
The objective of the Act is to "restore and maintain the chemical physical, and biological integrity of the Nation's waters."...
The goals are:

- To reach, "wherever attainable, a water quality that provides for the protection and propagation of fish, shellfish and wildlife" and "for recreation in and on the water" by July 1, 1983.

- To eliminate the discharge of pollutants into navigable waters by 1985.

The Act provides for achieving its goals and objectives in phases, with accompanying requirements and deadlines.
Phase I, an extension of the program embodied in many state laws and Federal regulations, requires industry to install "best practicable control technology currently available (BPT); and publically owned treatment works to achieve secondary treatment -- by July 1, 1977 --- as well as "any more stringent limitations, including those to meet [state or Federal] water quality standards ..." [Sec 301(b) (1) (c)]
Phase II requirements are intended to be more vigorous and more innovative. Industries are to install "best available technology economically achievable [BAT]... which will result in reasonable further progress toward the national goal of eliminating the discharge of all pollutants"; and publicly owned treatment works are to achieve "best practicable waste treatment technology... including reclaiming and recycling of water, and confined disposal of pollutants" (BPWTT) -- by July 1, 1983 -- as well as any water quality related effluent limitation. (Sec 302) Ultimately all point source controls are directed toward achieving the national goal of the elimination of the discharge of pollutants by 1985. (8)

The National Wild and Scenic Rivers Act of 1968 (PL 90-542) declared it

> ".....to be the policy of the United States that certain selected rivers of the Nation...be preserved in free-flowing condition, and that they and their immediate environments shall be protected...."

The Act designated eight rivers as initial components of the National Wild and Scenic River System and 27 rivers for study as potential additions. None of the eight designated rivers, but the following three of the potential additions to the National System are in the PA ORBES Region.

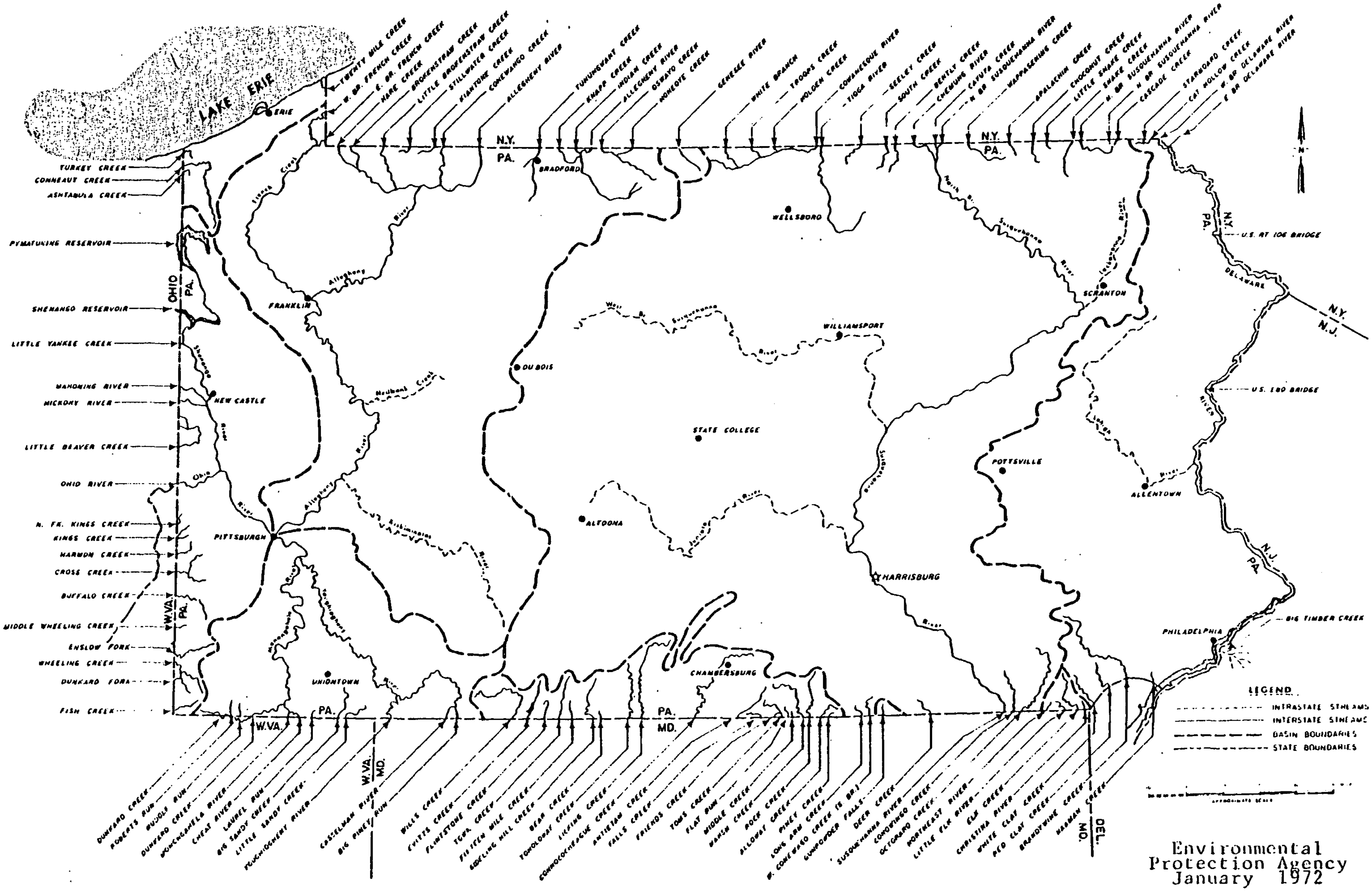
- Allegheny River from mouth to East Brady in the middle and Lower Allegheny Basins
- Clarion River from Ridgeway to its confluence with the Allegheny River in the Middle Allegheny River Basin
- Youghiogheny River from Youghiogheny River Dam to Connellsville in the Monongahela River Basin

It can be expected that water pollution abatement efforts will be accelerated along these rivers in order to qualify them for inclusion. A recently completed study on the Youghiogheny River by the U.S. Department of the Interior found the river water quality sufficiently improved to support significant sport fisheries and recreation and recommended that the 27-mile segment of the Youghiogheny between Youghiogheny Dam and South Connellsville, PA., be included in the National Wild and Scenic Rivers System (9).

B. State Control

In 1965 Congress authorized the establishment of water quality standards for interstate water. The Water Quality Act of 1965 provided for the States to have the first opportunity to establish these standards for their interstate waters. Pennsylvania's standards were approved by the Secretary of the Interior in 1968 (10). Figure 2.1.6.-8 shows a map of the significant interstate

FIGURE 2.1.6.-8 SIGNIFICANT INTERSTATE WATERS OF THE COMMONWEALTH OF PENNSYLVANIA   Source (10)



waters to which the standards apply. The ORBES counties include interstate streams from the Casselman River on the Maryland border - to the Allegheny River on the New York border.

Control over internal waters has been under the active jurisdiction of the Pennsylvania State government since 1923. In 1937 "The Clean Streams Law" of Pennsylvania was passed which provided for the preservation and improvement of State streams. A recent issue of the "Pennsylvania Bulletin"(11) relates some of the new changes in the State Law, and outlines the history of control over Pennsylvania's water quality:

> Water quality standards are an important element of the State's water quality management program in that they set general and specific goals for the quality of our streams. Some type of water quality standard has been in use for more than 50 years in Pennsylvania. One of the Sanitary Water Board's early action after its creation in 1923 was to classify streams as to priority for water quality management actions: In 1947 the Sanitary Water Board classified all streams in the state as to the degree of treatment that had to be provided before discharge.
>
> During the period 1966 through 1973, specific water quality standards were developed by the Department of Environmental Resources for all Pennsylvania surface waters. These water quality standards had three major parts: (1) a listing of water uses to be protected; (2) general water quality criteria and specific water quality criteria; and (3) a plan of implementation describing the effluent limits necessary for point source discharges to meet the water quality criteria.
>
> After a series of public hearings, the water uses and water quality criteria for Pennsylvania streams were incorporated into Chapter 93 of the Department's Rules and Regulations. The implementation plans were not adopted as regulations. The implementation plans served as the basis for notices and orders to upgrade wastewater treatment that were issued to manicipalities and industries. Since 1973, they have also been used as the basis for certifying effluent limits in federal wastewater discharge permits (NPDES). Public Law 92-500, which amended the Federal Water Pollution Control Act, has changed the make up of the old water quality standards by eliminating the implementation plan as a part of the standard. Implementation has now been made a part of the areawide water quality management planning process and the NPDES permit process in the federal program. The new water quality standards can, however, affect waste sources since the Department must take action to insure that the water quality standards (instream) are met. The standards are to be used as program objectives in the control of both point and non-point sources of pollution. (11)

Figure 2.1.6.-9 shows a map of the internal waters of Pennsylvania to which the State standards apply. The major drainage areas and tributaries within the PA-ORBES Region are listed in Table 2.1.6.-4.

Pennsylvania also has control over the degradation of high quality waters in the State. The policy was approved by the Environmental Protection Agency in 1971 and is enforceable under both Pennsylvania and Federal law (10). The new wording of this policy in the proposed revisions for 1978 wastewater treatment requirements (Chapter 95) states that:

> ...waters having a water use designated as "High Quality Waters"... shall be maintained... at their existing quality, unless... the proposed... discharge... of pollutants is justified as a result of necessary economic or social development which is of significant public value. (11)

In the existing regulations governing high quality waters they are called "Conservation Areas" and fall under the heading of "Recreation" (Chapter 93, (12)). A list of the existing Conservation Area Watersheds in the ORBES counties is presented in Table 2.1.6.-5. However, the concept has been expanded in the 1978 proposed revisions and high quality waters have become a water use in their own right, independent of recreational use (Chapter 93, (11)). Most of watersheds presently classified as "Conservation Area" streams are proposed to be renamed "High Quality Waters" or "Exceptional Value Waters" under the general title "Special Protection".

Pennsylvania's Scenic Rivers Act (Act. No. 283, December 1972) authorized the establishment of the Pennsylvania Scenic River System. The Act established four classifications into which streams could be assigned: (27)

Class 1 Wild river areas - those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted.

Class 2 Scenic river areas - those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and undeveloped, but accessible in places by roads.

FIGURE 2.1.6.-9 PENNSYLVANIA GAZETTEER OF STREAMS

INDEX MAP

Source (11)

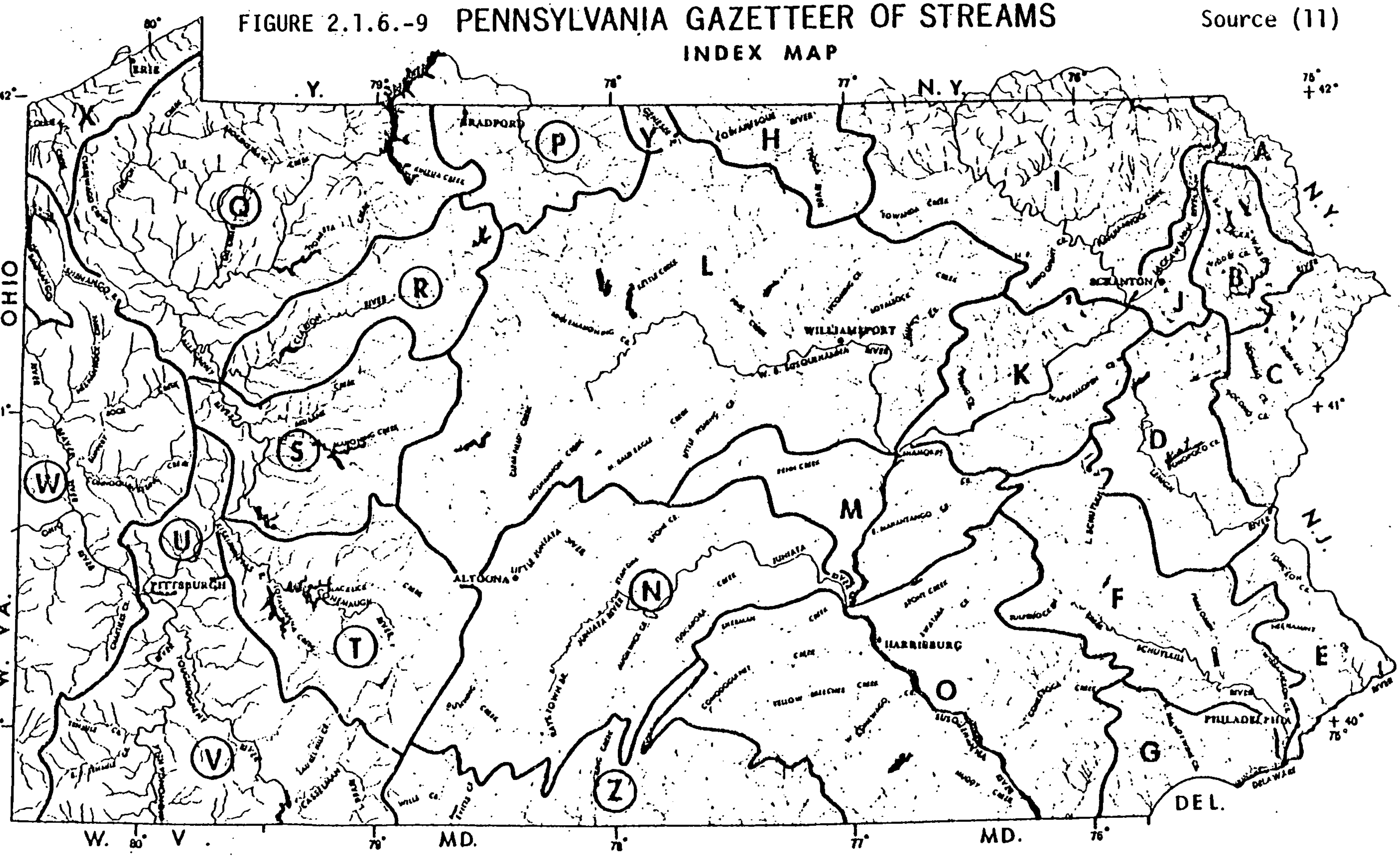


TABLE 2.1.6.-4

MAJOR DRAINAGE AREAS AND TRIBUTARIES IN THE PA ORBES REGION

RIVER	DRAINAGE AREA (See Fig. 2.1.6.-9)	TRIBUTARY	TRIBUTARY
Allegheny	Q	Tionesta Creek Oil Creek French Creek Sandy Creek	 Sugar Creek
	R	Clarion River	Spring Creek Toby Creek
	S	Bear Creek Redbank Creek Mahoning Creek Cowanshannock Cr. Crooked Creek	 Sandy Lick Creek Little Mahoning Creek
	T	Kiskiminetas River	Conemaugh River Stony Creek Two Lick Creek Loyalhanna Creek
	U	Buffalo Creek Deer Creek Plum Creek Pine Creek	
Monongahela	V	Cheat River Dunkard Creek Georges Creek Whiteley Creek Tenmile Creek Dunlap Creek Redstone Creek Peters Creek Youghiogheny River Turtle Creek	 South Fork Tenmile Creek Casselman River Laurel Hill Creek Indian Creek Jacobs Creek Sewickley Creek Abers Creek
Ohio	W	Chartiers Creek Beaver River Raccoon Creek	 Mahoning River Shenango River Connoquenessing Creek Slippery Rock Creek
West Branch Susquehanna (Not in the Ohio River Watershed)	L	Chest Creek Anderson Creek Clearfield Creek Moshannon Creek Bennett Branch - Sinnemahoning Cr.	
Susquehanna (Not in the Ohio River Watershed)	N	Raystown Branch - Juniata River	
Potomac River (Not in the Ohio River Watershed)	Z	Wills Creek	

TABLE 2.1.6.-5

CONSERVATION AREA WATERSHEDS IN ORBES COUNTIES IN PENNSYLVANIA

After Source (11)

Allegheny County - None

Armstrong County

- Buffalo Creek and tributaries from the source to and including Little Buffalo Creek (see also Butler County)

- Pine Creek watershed

Beaver County - None

Butler County

- Buffalo Creek and tributaries from the source to and including Little Buffalo Creek (see also Armstrong County)

Clarion County

- Turkey Run
- Beaver Creek
- "Upper" Mill Creek (Also Jefferson County)
- Blyson Run
- Maxwell Run
- Cather Run (Also Jefferson County)

Cambria County

- West Branch of the Susquehanna River Basin
  1. Chest Creek Basin, source to municipal water supply intake in Patton Borough

- Conemaugh River Basin
  1. Saltlick Run Basin
  2. South Fork Little Conemaugh River Basin from and including Beaverdam Run to source
  3. Bens Creek Basin
  4. Noels Creek Basin
  5. Laurel Run Basin

Clearfield County

- West Branch Susquehanna River Tributaries
  1. Trout Run Basin
  2. Lick Run Basin
  3. Moose Creek Basin from Moose Creek Dam to source
  4. Montgomery Creek Basin from Montgomery Dam to source
  5. Anderson Creek Basin from DuBois Dam to source
  6. South Branch Basin of Bennett Branch

- Redbank Creek basin
  1. Wolf Run Basin

- Mahoning Creek basin
  1. East Branch Mahoning Creek Basin from source to but not including Beaver Run
  2. Clover Run Basin

Elk County

- Sinnemahoning Creek Basin
  1. Mix Run Basin - Bennett Branch
  2. Hicks Run Basin - Bennett Branch
  3. Medix Run Basin - Bennett Branch
  3. Laurel Run Basin - Bennett Branch
- Spring Creek (Also Forest County)
- Crow Run
- Bear Creek
- Big Mill Creek
- Little Mill Creek
- Silver Creek
- Wolf Run
- E. Br. Clarion
- S. Br. Tionesta Creek
- Millstone Creek (Also Jefferson County)
- Wyncoop Run
- Maxwell Run (Also Jefferson County)

Fayette County

- Dunbar Creek and tributaries from its source to and including Elk Rock Run
- Morgan Run watershed
- Tributaries of Big Sandy Creek

Forest County

- Tubbs Run
- L. Hickory Run
- E. Hickory Creek
- L. Coon Creek
- Ross Run
- Bear Creek
- Salmon Creek
- Fork Run
- Bobbs Creek
- Blood Run
- Minister Creek
- Fools Creek
- Lower Sheriff Run
- Upper Sheriff Run
- Blue Jay Creek
- Troutman Run
- Coleman Run
- Maple Creek
- Cherry Run

Greene County - None

Indiana County

- Little Yellow Creek watershed
- South Branch of Two Lick Creek watershed
- Richards Run watershed
- South Branch of Plum Creek watershed from source to, but not including, Reddens Run

Jefferson County

- Callen Run
- Clear Creek
- Sugarcamp Run (Also Indiana County)
- Clover Run
- N. Fk. Redbank Creek
- L. Mill Creek
- Schoolhouse Run
- Falls Creek

Somerset County

- Potomac River Basin
  1. The basins of Wills Creek tributaries from source to Pennsylvania-North Branch Jennings Run and Gooseberry Run Basins

- Youghiogheny River Basin
  1. Laurel Hill Creek Basin

- Conemaugh River Basin
  1. North Fork Bens Creek Basin
  2. South Fork Bens Creek Basin
  3. Bobcock Creek Basin
  4. Clear Shade Creek Basin
  5. Roaring Run Basin
  6. Beaverdam Creek Basin (Tributary of Quemahoning Creek)
  7. Spruce Run Basin
  8. Beaverdam Creek Basin (Tributary of Stony Creek)

Washington County - None

Westmoreland County

- Loyalhanna Creek watershed from source to and including Laughlintown Run
- Serviceberry Run watershed
- Indian Camp Run watershed
- Coalpit Run watershed
- South Fork of Mill Creek watershed
- North Fork of Mill Creek watershed
- Shirey Run watershed
- Tubmill Run watershed above Tubmill reservoir
- Shannon Run watershed
- Baldwin Creek watershed

Class 3 Recreational rivers - those rivers or sections of rivers that are readily accessible, that may have some development along their shorelines and may have undergone some impoundment or diversion in the past.

Class 4 Modified recreational rivers - those rivers or sections of rivers in which the flow may be regulated by control devices located upstream. Low dams are permitted in the reach so long as they do not increase the river beyond bank-full width. These reaches are used for human activities which do not substantially interfere with public use of the streams or the enjoyment of their surroundings.

The Department of Environmental Resources published a list of potential candidate streams for inclusion in this protected river system (13). The streams selected from the ORBES Region are listed in Table 2.1.6.-6. As can be seen in the Table, the candidate streams were categorized according to their relative area-wide significance (first, second, and third priorities) and the First Priority streams were further subdivided into three priority subgroups (A, B, and C) based upon the urgency of protective action.

It can be expected that several years will pass before detailed studies on the candidate streams will be completed and any one of them will be legally designated a Pennsylvania Scenic River with mandated restrictions on development in the designated segment. However, in the meantime, the nomination can be regarded as an environmental constraint where special emphasis will be placed on the examination of all related activity. Currently, (mid-1978) DER is in the process of completing detailed studies of French Creek and Dunbar Creek in the ORBES Region for possible nomination.

C. Water Quality Standards

Water Quality standards are contained in Chapter 93 of the "Rules and Regulations"(12) published by the Department of Environmental Resources. Confusion over the meaning of the words "criteria" and "standards" was generated by their use in the 1965 amendments to the Federal Water Pollution Control Act. The Department of Environmental Resources (State) has recently

TABLE 2.1.6.-6 PROPOSED PENNSYLVANIA SCENIC RIVERS IN THE ORBES REGION — Sources (13) & (27)

Drainage Area(a)	Stream Name	Location (County)	Segment Limits	Class (b)	Priority Group(c)
Q	Tionesta Creek	Forest, McKean, Warren(d)	Headwaters to Tionesta Reservoir	S	1A
	Lake Creek	Crawford, Venango(d)	Headwaters to Sugar Creek	R	1A
	Sugar Creek	Venango	Junction of Brandies to French Creek	MR	1A
	French Creek	Crawford, Mercer, Venango(d)	Headwaters to Allegheny River	MR	1A
	Allegheny River	Warren, Forest, Venango, Clarion(d)	Kinzua Dam to Clarion River	S, R, MR	1A
	Oil Creek	Crawford, Venango(d)	Titusville to Rouseville	S	1B
	Pithole Creek	Forest, Venango	Headwaters to Allegheny River	S	2
	East Sandy Creek	Clarion, Venango	Headwaters to Allegheny River	R	2
	Sandy Creek	Mercer, Venango	Sandy Lake to Allegheny River	R	2
	Little Scrubgrass Creek	Butler, Venango	Headwaters to Allegheny River	S	2
R	Clarion River	Clarion, Elk, Forest, Jefferson	Ridgeway to Allegheny River	S	1A
	Bear Creek	Elk	Headwaters to Clarion River	S	1B

TABLE 2.1.6.-6 Continued

Drainage Area(a)	Stream Name	Location (County)	Segment Limits	Class (b)	Priority Group(c)
S	North Fork, Redbank Creek	Jefferson	Headwaters to Redbank Creek	W, S	1A
	Allegheny River	Clarion	Clarion River to East Brady	S	1A
	Allegheny River	Armstrong	East Brady to Kiski-minetas River	S, MR	1C
	Redbank Creek	Armstrong, Clarion	S. Bethlehem to Allegheny River	S	2
	Mahoning Creek	Armstrong	Mahoning Creek Lake to Allegheny River	R	3
	Cowanshannock Creek	Armstrong	Junction of Branches to Allegheny River	S	3
T	Clear Shade Creek	Somerset	Headwaters to Shade Creek	S	2
	Shade Creek	Somerset	Clear Shade Creek to Stone Creek	S	2
	Loyalhanna Creek	Westmoreland	Ligonier to Conemaugh River	MR	2
	Stony Creek	Somerset	Headwaters to Paint Creek	S	3
	Blacklick Creek	Indiana	Cambria/Indiana County to Conemaugh River	R	3
	Conemaugh River	Indiana, Westmoreland	Cambria/Westmoreland County to Kiskiminetas River	R	3
U	Squaw Run	Allegheny	Headwaters to Allegheny River	S	1A
	Buffalo Creek	Armstrong, Butler	Worthington to Allegheny River	S	1B
	Allegheny River	Allegheny, Westmoreland	Kiskiminetas River to Pittsburgh	MR	1C

TABLE 2.1.6.-6 Continued

Drainage Area(a)	Stream Name	Location (County)	Segment Limits	Class (b)	Priority Group(c)
U (Cont.)	Crouse Run	Allegheny	Headwaters to Pine Creek	S	3
V	Laurel Hill Creek	Somerset	Headwaters to Casselman River	S	1A
	Casselman River	Somerset	Garrett to Youghiogheny River	S	1A
	Meadow Run	Fayette	Headwaters to Youghiogheny River	R	1A
	Cucumber Run	Fayette	Headwaters to Youghiogheny River	S	1A
	Jonathan Run	Fayette	Headwaters to Youghiogheny River	W	1A
	Indian Creek	Fayette	Mill Run Reservoir to Youghiogheny River	R	1A
	Dunbar Creek	Fayette	Headwaters to Dunbar	W	1A
	Youghiogheny River	Somerset, Fayette	Confluence, Pa. to South Connellsville	S	1A
	Youghiogheny River	Fayette, Westmoreland	South Connellsville to West Newton	S	1B
	Youghiogheny River	Westmoreland, Allegheny	West Newton to Versailles	R	1C
	Mill Run	Fayette	Headwaters to Quebec Run	W	2
	Quebec Run	Fayette	Headwaters to W. Va. border	W	2
	Tenmile Creek	Greene, Washington	Daniel Run to Monongehela River	R	2
	Jacobs Creek	Fayette, Westmoreland	Headwaters to Youghiogheny River	S	3

TABLE 2.1.6.-6 Continued

Drainage Area(a)	Stream Name	Location (County)	Segment Limits	Class (b)	Priority Group(c)
V (Cont.)	Brush Creek	Westmoreland	Brush Run to Turtle Creek	MR	3
	Monongahela River	Greene, Fayette, Washington, Westmoreland, Allegheny	Point Marion to Pittsburgh	MR	3
W	Wolf Creek	Butler, Mercer	Headwaters to Slippery Rock Creek	S	1A
	Slippery Rock Creek	Butler, Lawrence	Headwaters to Connoquenes-sing Creek	MR, S	1A
	Connoquenessing Creek	Lawrence	Slippery Rock Creek to Beaver River	R	1A
	Dutch Fork-Buffalo Creek	Washington	Headwaters to Buffalo Creek	S	1B
	Buffalo Creek	Washington	Acheson to W. Va. Border	S	1B
	Enlow Fork-Wheeling Creek	Greene	Headwaters to W. Va. Border	S	1B
	Dunkard Fork-Wheeling Creek	Greene	Ryerson Station to W. Va. Border	S	1B
	Connoquenessing Creek	Beaver, Butler, Lawrence	Headwaters to Slippery Rock Cr.	R	1C
	N. Fork-Little Beaver Creek	Beaver, Lawrence	Beaver/Lawrence County, Ohio Border	R	1C
	Aunt Clara Fork-Kings Creek	Washington	Headwaters to Kings Creek	S	1C
	Little Sewickley Creek	Allegheny	Headwaters to Ohio River	S	2
	Hickory Run	Lawrence	Bessemer to Mahoning River	S	2
	Neshannock Creek	Lawrence	Volant to Shenango River	S	2

TABLE 2.1.6.-6 Continued

Drainage Area (a)	Stream Name	Location (County)	Segment Limits	Class (b)	Priority Group (c)
W (Cont.)	Raccoon Creek	Beaver, Washington	Burgetts Fork to Ohio River	R	3
	Ohio River	Allegheny, Beaver	Pittsburgh to Ohio/W. Va. Border	MR	3
L(e)	Mosquito Creek	Elk, Clearfield	Headwaters to West Branch Susquehanna River		1A
	West Branch Susquehanna River	Clearfield	Entire length		1A
	S. Branch-Bennett Branch	Clearfield	Headwaters to Bennett Branch		1B
	Chest Creek	Cambria	Headwaters to Rock Run		2
	West Branch Hicks Run	Cameron, Elk	Headwaters to Hicks Run		2
	East Branch Hicks Run	Cameron, Elk	Headwaters to Hicks Run		2
	Hicks Run	Elk	Junction of Branches to Sinnemahoning Creek		2
	Hockenberry Run	Clearfield	Entire length		3
	South Witmer Run	Clearfield	Entire length		3
	North Witmer Run	Clearfield	Entire length		3
	Little Clearfield Creek	Clearfield	Olanta to Clearfield Creek		3
	Stone Run	Clearfield	Entire length		3
	Lick Run	Clearfield	Entire length		3
	Trout Run	Clearfield	Entire length		3

TABLE 2.1.6.-6 Continued

Drainage Area(a)	Stream Name	Location (County)	Segment Limits	Class (b)	Priority Group(c)
L (Cont.)	Upper Three Runs	Clearfield	Entire length		3
	Medix Run	Clearfield, Elk	Headwaters to Bennett Branch-Sinnemahoning Creek		3
	Trout Run	Elk	Entire length		3
N(e)	Raystown Branch Juniata River	Somerset	Entire length in County		1B
Z(e)	Wills Creek	Somerset	Entire length in County		3

NOTES:

(a) Refer to Figure 2.1.6.-9 and Table 2.1.6.-4

(b) Class designations:
W = Wild River Areas
S = Scenic River Areas
R = Recreational Rivers
MR= Modified Recreational Rivers

(c) Priority Groups:
1. First priority, statewide or national significance
   1A: First priority, most urgent need for protection
   1B & 1C: First priority, less than immediate concern

2. Second priority, regional significance

3. Third priority, local significance

(d) Crawford, Warren and McKean Counties are not in the ORBES Region

(e) Drainage areas L, N and Z are not in the Ohio River Basin proposed revisions to the "Rules and Regulations" which, among other things, clarify the terminology and format of the Chapter. The definitions of "criteria" and "standard" are: (11)

> Water Quality Criteria - levels of parameters or stream conditions that need to be maintained or attained to prevent or eliminate pollution.
> Water Quality Standards - the combination of water uses to be protected and water quality criteria necessary to protect those uses.

In line with this the proposed revisions are to change the title of Chapter 93 from "Water Quality Criteria" to "Water Quality Standards" and to rescind the chapter in its entirety and substitute a more comprehensive one.

These proposed revisions, although not yet adopted, are probably a more accurate reflection of the standards as they will be applied to the ORBES region in the near future than the existing standards(12) which were last amended in September 1976. Selected information for the proposed chapter is reproduced in the following tables:(11)

Table 2.1.6.-7 defines the words used in describing water quality standards so that there is no confusion in legal interpretation.

Table 2.1.6.-8 updates the uses of water by adding a section on "Special Protection" of high quality waters.

Table 8.1.6.-9 describes the manner in which water quality criteria are applied to the discharge of pollutants, and to the protection of aquatic life. It also distinguishes between general and specific water quality criteria.

Table 2.1.6.-10 details the specific water quality criteria for the parameters by imposing numerical limits.

Table 2.1.6.-11 combines the specific criteria with the designated water use for the major strams in the PA ORBES Region. The list includes the hydrological location and the county of each stream as well as the exceptions to the specific criteria according to the designated water use. The complete list for all streams in Pennsylvania can be found in Reference (11).

TABLE 2.1.6.-7

PROPOSED WATER QUALITY STANDARDS AS OF MARCH 1978: DEFINITIONS

Source (11)

It is recommended that the existing Chapter 93 be rescinded in its entirety and the following substituted in its place.

CHAPTER 93. WATER QUALITY STANDARDS

TABLE OF CONTENTS

§ 93.1. Definitions.

The following words and terms, when used in this chapter, shall have the following meanings, unless the context clearly indicates otherwise:

Ambient stream concentration — The natural range in concentration or level of a water quality parameter which would be expected to occur in the absence of human activities; the value is normally determined from quality measurements of waters that are not affected by waste discharges or other human activities.

Ambient temperature — The temperature of the water body upstream of a heated waste discharge or waste discharge complex. The ambient temperature sampling point should be unaffected by any sources of waste heat.

Application factor — A standard factor to be applied to a 96-hour LC50 value to determine a safe concentration value for a pollutant.

Balanced community — An assemblage of various aquatic plant and animal life forms which function as an independent integrated unit which is diverse, including the presence of pollutant-sensitive species and the nondomination of pollutant-tolerant species, and which is self-sustaining.

Carcinogenic — Producing cancer.

Clean Streams Law — The Clean Streams Law (35 P. S. §§ 691.1-691.1001).

Cumulative pollutant — A pollutant which is increased in concentration in an organism by successive additions at different times or in different ways, that is, bioaccumulation.

Effluent limits — Any restriction established by the Department on quantities, rates, and concentrations of pollutants which are discharged into the waters of this Commonwealth.

Epilimnion — Warm upper layer of uniform temperature in a stratified body of water, such as a lake or impoundment.

Federal Water Pollution Control Act — 33 U.S.C.A. §§ 1251-1376.

Minimum daily average — The arithmetic average of all determinations made during a 24-hour period.

Monthly average — The arithmetic average of all determinations made during a calendar month.

Mutagenic — Producing changes in the chromosomes of genes.

96-Hour LC50 value — The concentration of a pollutant in test waters that is lethal to 50% of the test organisms during continuous exposure for a period of 96 hours.

Noncumulative pollutant — A pollutant which is not increased in concentration in an organism by successive additions at different times or in different ways.

Nonpersistent pollutant — A pollutant with a half-life of less than four days in water of quality which is comparable to that of the receiving stream.

Persistent pollutant — A pollutant with a half-life of more than four days in water of quality comparable to the receiving stream.

Representative important species — Those species of aquatic life whose protection and propagation will assure the sustained presence of a balanced community of aquatic life and waterfowl in and on the waters of this Commonwealth. Such species are representative in the sense that maintenance of water quality criteria will assure both the natural completion of the species' life cycles and the overall protection and propagation of the balanced community.

Safe concentration value — A value not exceeding the safe concentration for a pollutant as determined through application of a factor to a 96-hour LC50 value resulting from the standard continuous flow bioassay test.

Teratogenic — Producing monstrosities, malformations, or deviations from the normal structure.

Test water — Distilled carbon filtered deionized water which meets certain quality specifications before reconstituting with specific amounts of various salts so that it approximates the chemical conditions of the receiving waters.

Water quality criteria — Levels of parameters or stream conditions that need to be maintained or attained to prevent or eliminate pollution.

Water quality standards — The combination of water uses to be protected and the water quality criteria necessary to protect those uses.

§ 93.2. Scope.

The provisions of this chapter set forth water quality standards for the waters of this Commonwealth. These standards are based upon water uses which are to be protected and will be considered by the Department in its regulation of discharges.

TABLE 2.1.6.-8

PROPOSED WATER QUALITY STANDARDS AS OF MARCH 1978:
PROTECTED WATER USES

Source (11)

§ 93.3. Protected water uses.

Water uses which shall be protected and upon which the development of water quality criteria shall be based are set forth, accompanied by their identifying symbols, in the following Table 1:

TABLE 1

Symbol	Protected Use
	Aquatic Life
CWF	*Cold Water Fishes* — Maintenance and/or propagation of fish species including the family Salmonidae and additional flora and fauna which are indigenous to a cold water habitat.
WWF	*Warm Water Fishes* — Maintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat.
MF	*Migratory Fishes* — Passage, maintenance and propagation of anadromous and catadromous fishes and other fishes which ascend to flowing waters to complete their life cycle.
TSF	*Trout Stocking* — Maintenance of stocked trout from February 15 to July 31 and maintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat.
	Water Supply
PWS	*Potable Water Supply* — Use by humans after conventional treatment for drinking, culinary, and other purposes, such as inclusion into foods (either directly or indirectly).
IWS	*Industrial Water Supply* — Use by industry for inclusion into non-food products, processing and cooling.
LWS	*Livestock Water Supply* — Use by livestock and poultry for drinking and cleansing.
AWS	*Wildlife Water Supply* — Use for waterfowl habitat and for drinking and cleansing by wildlife.
IRS	*Irrigation* — Used to supplement precipitation for growing crops.
	Recreation
B	*Boating* — Use of the water for power boating, sail boating, canoeing, and rowing for recreational purposes when surface water flow or impoundment conditions allow.
F	*Fishing* — Use of the water for the legal taking of fish.
WC	*Water Contact Sports* — Use of the water for swimming and related activities.
E	*Esthetics* — Use of the water as an esthetic setting to recreational pursuits.
	Special Protection
HQ	*High Quality Waters* — A stream or watershed which has excellent quality waters and environmental or other features that require special water quality protection.
EV	*Exceptional Value Waters* — A stream or watershed which constitutes an outstanding national, state, regional or local resource, such as waters of National, State or County parks or forests, or waters which are used or are projected for use as a source of water supply, or waters of wildlife refuges or State game lands, or waters which have been characterized by the Pennsylvania Fish Commission as "Wilderness Trout Streams," and other waters of substantial recreational or ecological significance.
	Other
N	*Navigation* — Use of the water for the commercial transfer and transport of persons, animals and goods.
TWA	*Treated Waste Assimilation* — Use of the water for assimilation and transport of treated wastewaters.

TABLE 2.1.6.-9

PROPOSED WATER QUALITY STANDARDS AS OF MARCH 1978:
WATER QUALITY CRITERIA APPLICATIONS

Source (11)

§ 93.5. Application of water quality criteria to discharge of pollutants.

(a) The water quality criteria prescribed in this chapter for the various designated uses of the waters of this Commonwealth apply to receiving waters and are not to be necessarily deemed to constitute the effluent limit for a particular discharge, but, rather, are one of the major factors to be considered in developing specific limitations on the discharge of pollutants.

(b) The accepted design stream flow to which the water quality criteria as set forth in this chapter shall apply is the actual or estimated lowest seven-consecutive-day average flow that occurs once in ten years for a stream with unregulated flow or the estimated minimum flow for a stream with regulated flows, except where the Department determines that a more restrictive application is necessary to protect a particular designated or existing use. Where the lowest seven-consecutive-day average flow that occurs once in ten years is 0, the Department will specify the design flow conditions on a case-by-case basis.

(c) Where adopted water quality criteria as set forth in § 93.9 of this title (relating to designated water uses and water quality criteria) are more stringent than natural or ambient stream concentrations of specific water quality indicators, such natural or ambient stream concentrations shall be deemed to be the applicable criteria used to establish specific effluent limits.

§ 93.6. General water quality criteria.

(a) Water shall not contain substances attributable to point or non-point source waste discharges in concentration or amounts sufficient to be inimical or harmful to the water uses to be protected or to human, animal, plant, or aquatic life.

(b) Specific substances to be controlled shall include, but shall not be limited to, floating debris; oil; grease; scum and other floating materials; toxic substances; pesticides; chlorinated hydrocarbons; carcinogenic; mutagenic; and teratogenic materials; and substances which produce color, tastes, odors, or turbidity or which settle to form deposits.

§ 93.7. Specific water quality criteria.

(a) Waters of this Commonwealth for which specific criteria have been established are listed in § 93.9 of this chapter (relating to designated water uses and water quality criteria).

(b) References to specific criteria shall be keyed to use the list of specific criteria set forth in subsection (c) of this section and to groups of criteria set forth in subsection (d) of this section.

(c) The following Table 3 shall display the specific water quality criteria:

See TABLE 2.1.6.-10

(d) Unless otherwise specified in subsection (e) of this section and § 93.9 of this title (relating to designated water uses and water quality criteria), State-wide specific criteria set forth in the following Table 4 shall apply to all surface waters of this Commonwealth:

TABLE 4

Symbol	*Specific Water Quality Criteria*
Al	Aluminum
Alk,	Alkalinity,
As	Arsenic
Bac,	Bacteria,
Cr	Chromium
Cu	Copper
CN	Cyanide
F	Fluoride
Fe	Iron
Pb	Lead
Mn	Manganese
Ni	Nickel
N	Nitrite plus Nitrate
pH,	pH,
Phen,	Phenol,
TDS,	Total Dissolved Solids,
Sul	Sulfate
Zn	Zinc

(e) The following Table 5 contains groups of specific water quality criteria based upon water uses to be protected. When the symbols listed below appear in the Water Uses Protected column in § 93.9 of this title (relating to designated water uses and water quality criteria), they have the meaning listed in the table below. Exceptions to these standardized groupings will be indicated on a stream-by-stream or segment-by-segment basis by the words "Add" or "Delete" followed by the appropriate symbols described in subsection (c) — Table 3 of this section.

TABLE 5

Symbol	*Water Uses Included*	*Specific Criteria*
WWF	State-wide list	State-wide list plus DO_2 and $Temp_2$
CWF	State-wide list plus cold water fish	State-wide list plus DO_1 and $Temp_1$
TSF	State-wide list plus trout stocking	State-wide list plus DO_3 and $Temp_3$
HQ-WWF	State-wide list plus high quality waters minus treated waste assimilation	State-wide list plus DO_1 and $Temp_2$
HQ-CWF	State-wide list plus high quality water and cold water fish; minus treated waste assimilation	State-wide list plus DO_6 and $Temp_1$
HQ-TSF	State-wide list plus high quality water and trout stocking; minus treated waste assimilation	State-wide list plus DO_1 and $Temp_3$
EV	State-wide list plus exceptional value water; minus treated waste assimilation	Existing quality

(f) The list of specific water quality criteria does not include all possible substances that could cause pollution. For substances not listed, the general criterion that these substances shall not be inimical or injurious to the designated water uses applies. The best scientific information available will be used to adjudge the suitability of a given waste discharge where these substances are involved.

§ 93.8. Development of specific water quality criteria for the protection of aquatic life.

(a) When a specific water quality criterion has not been established for a pollutant in § 93.7 (c) — Table 3 or (f) of this title (relating to specific water quality criteria) and a discharge of pollutant into waters of this Commonwealth designated to be protected for aquatic life in § 93.9(b) of this title (relating to designated water uses and water quality criteria) is proposed, a specific water quality criterion for such pollutant may be determined by the Department through establishment of a safe concentration value.

(b) Establishment of a safe concentration value shall be based upon data obtained from standard continuous flow bioassay tests which exist in substantial available literature or data obtained from specific tests utilizing representative important species of aquatic life designated by the Department and conducted in a water environment which is equal to or closely approximates that of the natural quality of the receiving waters.

(c) Safe concentration values of pollutants shall be determined by applying an application factor to the 96-hour LC50 value. Except where the Department determines, based upon substantial available data, that an alternate application factor exists for a pollutant, the following application factors shall be used in the determination of safe concentration values:

(1) Concentrations of pollutants that are nonpersistent or noncumulative shall not exceed 0.05 (1/20) of the 96-hour LC50.

(2) Concentrations of pollutants that are persistent or cumulative shall not exceed 0.01 (1/100) of the 96-hour LC50.

(d) Persons seeking issuance of a permit pursuant to the Clean Streams Law or an NPDES certification pursuant to Section 401 of the Federal Water Pollution Control Act — 33 U.S.C. § 1341 authorizing the discharge of a pollutant for which a safe concentration value is to be established using specific bioassay tests pursuant to subsection (c) of this section shall perform such testing under the direction of the Department and shall submit all of the following in writing to the Department:

(1) A plan proposing the bioassay testing to be performed,

(2) Such periodic progress reports of the testing as may be required by the Department,

(3) A report of the completed results of such testing including, but not limited to;

(i) all data obtained during the course of testing; and

(ii) all calculations made in the recording, collection, interpretation, and evaluation of such data.

(e) Bioassay testing shall be conducted in accordance with the methodologies outlined in EPA Ecological Research Series Publication, EPA-660/3/75-009, Methods of Acute Toxicity Tests with Fish, Macroinvertebrates, and Amphibians (April, 1975); Standard Methods for the Examination of Water and Wastewater (14th Edition); or Standard Method of Test for ASTM D1345-59 (Reapproved 1970) and published in the 1975 Annual Book of ASTM Standards — Part 31 — Water. Use of any other methodologies shall be subject to prior written approval by the Department. Test waters shall be reconstituted according to recommendations and methodologies specified in the previously cited reference or methodologies approved in writing by the Department.

TABLE 2.1.6.-10

PROPOSED WATER QUALITY STANDARDS AS OF MARCH 1978: SPECIFIC WATER QUALITY CRITERIA

Source (11)

Parameter	*Symbol*	*Criteria*
Aluminum	Al	Not to exceed 0.1 of the 96-hour LC50 for representative important species.
Alkalinity	Alk_1	Equal to or greater than 20 mg/l as $CaCo_3$ for fresh water aquatic life, except where natural conditions are less. Where discharges are to waters with 20 mg/l or less alkalinity, the discharge should not further reduce the alkalinity of the receiving waters.
	Alk_2	Not less than 20 mg/l.
	Alk_3	Between 20 and 100 mg/l.
	Alk_4	Between 20 and 120 mg/l.
Ammonia Nitrogen	Am_1	Not more than 0.5 mg/l.
	Am_2	Not more than 1.5 mg/l.
Arsenic	As	Not to exceed 0.05 mg/l total arsenic.
Bacteria	Bac_1	During the swimming season (May 1 through September 30), the fecal coliform level shall not exceed a geometric mean of 200 per 100 milliliters (ml) based on five consecutive samples each sample collected on different days; for the remainder of the year, the fecal coliform level shall not exceed a geometric mean of 2000 per 100 milliliters (ml) based on five consecutive samples collected on different days.
	Bac_2	(Coliforms/100 ml) — Not more than 5,000/100 ml as a monthly average value, nor more than this number in more than 20% of the samples collected during any month, nor more than 20,000/100 ml in more than 5% of the samples.
	Bac_3	(Coliforms/100 ml) — Not more than 5,000/100 ml as a monthly geometric mean.
	Bac_4	(Fecal Coliforms/100 ml) — Maximum geometric mean of 770/100 ml; samples shall be taken at a frequency and location to permit valid interpretation.
Chloride	Ch_1	Not more than 150 mg/l.
	Ch_2	Not more than 250 mg/l.
	Ch_3	Not more than 200 mg/l.
	Ch_4	Maximum 15-day mean 50 mg/l.
Chromium	Cr	Not to exceed 0.05 mg/l as hexavalent chromium.
Color	Col	Not more than 75 units on the platinum-cobalt scale; no other colors perceptible to the human eye.
Copper	Cu	Not to exceed 0.1 of the 96-hour LC50 for representative important species.
Cyanide	CN	Not to exceed 0.005 mg/l as free cyanide.
Dissolved Oxygen	DO_1	Minimum daily average 6.0 mg/l; no value less than 5.0 mg/l. For lakes, ponds and impoundments only, no value less than 5.0 mg/l at any point.
	DO_2	Minimum daily average 5.0 mg/l; no value less than 4.0 mg/l. For the epilimnion of lakes, ponds and impoundments, minimum daily average of 5.0 mg/l, no value less than 4.0 mg/l.
	DO_3	Minimum daily average not less than 5.0 mg/l; during periods 4/1-6/15 and 9/16-12/31 not less than 6.5 mg/l as a seasonal average.
	DO_4	Minimum daily average not less than 3.5 mg/l; during periods 4/1-6/15 and 9/16-12/31 not less than 6.5 mg/l as a seasonal average.
	DO_5	For the period 2/15 to 7/31 of any year, minimum daily average of 6.0 mg/l, no value less 5.0 mg/l. For the remainder of the year, minimum daily average of 5.0 mg/l, no value less than 4.0 mg/l.
	DO_6	No value less than 7.0 mg/l.
Fluoride	F	Not to exceed 2.0 mg/l.
Hardness	Hd_1	Maximum monthly mean 150 mg/l.
	Hd_2	Maximum monthly mean 95 mg/l.
Iron	Fe	Not to exceed 1.5 mg/l as a total iron; not to exceed 0.3 mg/l as dissolved iron.
Lead	Pb	Not to exceed 0.05 mg/l.
Manganese	Mn	Not to exceed 1.0 mg/l as total manganese.
Methylene	$MBAS_1$	Not more than 0.5 mg/l.

Parameter	Symbol	Criteria
Blue Active Substance	$MBAS_2$	Not more than 1.0 mg/l.
Nickel	Ni	Not to exceed 0.01 of the 96-hour LC50 for representative important species.
Nitrite plus Nitrate	N	Not to exceed 10 mg/l as nitrate nitrogen.
pH	pH_1	Not less than 6.0 and not more than 9.0.
	pH_2	Not less than 6.5 and not more than 8.5.
	pH_3	Not less than 7.0 and not more than 9.0.
Phenol	$Phen_1$	Not to exceed 0.005 mg/l.
	$Phen_2$	Maximum 0.02 mg/l.
Phosphorus (Total Soluble as PO_4)	P_1	Not more than 0.10 mg/l.
	P_2	Not more than 0.30 mg/l.
	P_3	Not more than 0.40 mg/l.
Radioactivity	Rad	Alpha emitters, maximum 3 pc/1; beta emitters, maximum 1,000 pc/1.
Sulfate	S	Not to exceed 250 mg/l.
Temperature	$Temp_1$	No measurable rise when ambient temperature is 58°F. or above; not more than 5°F. rise above ambient temperature until stream temperature reaches 58°F.; not to be changed by more than 2°F. during any one-hour period.
	$Temp_2$	No measurable rise when ambient temperature is 87°F. or above; not more than 5°F. rise above ambient temperature until stream temperature reaches 87°F.; not to be changed by more than 2°F. during any one-hour period.
	$Temp_3$	For the period 2/15 to 7/31, no measurable rise when ambient temperature is 74°F. or above; not more than 5°F. rise above ambient temperature until stream temperature reaches 74°F., not to be changed by more than 2°F. during any one-hour period; for the remainder of the year, no measurable rise when ambient temperature is 87°F. or above; not more than 5°F. rise above ambient temperature until stream temperature reaches 87°F., not to be changed by more than 2°F. during any one-hour period.
	$Temp_4$	Not to exceed the following temperatures in the month indicated:

Month	Temperature, °F.
January	56
February	56
March	62
April	71
May	80
June	90
July	90
August	90
September	90
October	78
November	69
December	58

	$Temp_5$	Not more than 5°F. above the average daily temperature during the 1961-66 period, which is shown below, or a maximum of 86°F., whichever is less.

Average Daily Temperature
1961-1966
(Temperatures May Be Interpolated)

Date	*Delaware Estuary, Head of Tide to River Mile 108.4 (about 1 mile below Pennypack Creek)* °F	*Delaware Estuary, River Mile 108.4 (about 1 mile below Pennypack Creek) to Big Timber Creek* °F	*Delaware Estuary, from Big Timber Creek to Pennsylvania-Delaware State Line* °F
January 1	37	41	42
February 1	35	35	36
March 1	38	38	40
April 1	46	46	47
May 1	58	58	58
June 1	71	71	72
July 1	79	79	80
August 1	81	81	81

Date	*Delaware Estuary, Head of Tide to River Mile 108.4 (about 1 mile below Pennypack Creek)*	*Delaware Estuary, River Mile 108.4 (about 1 mile below Pennypack Creek) to Big Timber Creek*	*Delaware Estuary, from Big Timber Creek to Pennsylvania-Delaware State Line*
September 1	78	79	78
September 15	76	77	76
October 1	70	70	70
November 1	59	61	60
December 1	46	50	50
December 15	40	45	45

	Temp$_6$	Not more than 5°F. rise above the ambient temperatures until stream temperatures reach 50°F., nor more than 2°F. rise above ambient temperature when temperatures are between 50°F. and 58°F., nor shall temperatures exceed 58°F., whichever is less, except in designated heat dissipation areas.
	Temp$_7$	As a guideline, the maximum length of heat dissipation areas shall not be longer than 3,500 feet measured from the point where the waste discharge enters the stream. The width of heat dissipation areas shall not exceed two-thirds the surface width measured from shore to shore at any stage of tide or the width encompassing one-fourth the cross-sectional area of the stream, whichever is less. Within any one heat dissipation area only one shore shall be used in determining the limits of the area. Where waste discharges are close to each other, additional limitations may be prescribed to protect stream uses. Controlling temperatures shall be measured outside the heat dissipation area. The rate of temperature change in the heat dissipation area shall not cause mortality of the fish.
	Temp$_8$	As a guideline, the maximum length of heat dissipation areas shall not be longer than 3,500 feet or 20 times the average stream width, whichever is less, measured from the point where the waste discharge enters the stream. Heat dissipation areas shall not exceed one-half the surface stream width or the width encompassing one-half of the entire cross sectional areas of the stream, whichever is less. Within any one heat dissipation area, only one shore shall be used in determining the limits of the area. Where waste discharges are close to each other, additional limitations may be prescribed to protect water uses. Controlling temperatures shall be measured outside the heat dissipation zone. The rate of temperature change in designated heat dissipation areas shall not cause mortality of the fish.
	Temp$_9$	As a guideline, the maximum length of heat dissipation areas shall not be longer than 1,000 feet or 20 times the average width of the stream, whichever is less, measured from the points where the waste discharge enters the stream. Heat dissipation areas shall not exceed one-half the surface stream width or the width encompassing one-half of the entire cross sectional area of the stream, whichever is less. Within any one heat dissipation area, only one shore shall be used in determining the limits of the area. Where waste discharges are close to each other, additional limitations may be prescribed to protect water uses. Controlling temperatures shall be measured outside the heat dissipation zone. The rate of temperature change in designated heat dissipation areas shall not cause mortality of the fish.
Threshold Odor Number	TON	Not more than 24 at 60°C.
Total Dissolved Solids	TDS$_1$	Not more than 500 mg/l as a monthly average value; not more than 750 mg/l at any time.
	TDS$_2$	Not more than 1,500 mg/l at any time.
	TDS$_3$	Not to exceed 133% of ambient stream concentrations or 500 mg/l, whichever is less.
	TDS$_4$	Not to exceed 133% of ambient stream concentration.
Turbidity	Tur$_1$	Not more than 30 NTU during the period 5/30-9/15, nor more than a monthly mean of 40 NTU or a maximum of 150 NTU during the remainder of the year.
	Tur$_2$	Maximum monthly mean 40 NTU, maximum value not more than 150 NTU.
	Tur$_3$	Not more than 100 NTU.
	Tur$_4$	For the period 5/15-9/15 of any year, not more than 40 NTU; for the period 9/16-5/14 of any year, not more than 100 NTU.
	Tur$_5$	Maximum monthly mean of 10 NTU; maximum of 150 NTU.
	Tur$_6$	Maximum monthly mean of 20 NTU, maximum of 150 NTU.
	Tur$_7$	Maximum monthly mean of 30 NTU, maximum of 150 NTU.
Sulfate	Sul	Not to exceed 250 mg/l.
Zinc	Zn	Not to exceed 0.01 of the 96-hour LC50 for representative important species.

PROPOSED WATER QUALITY STANDARDS (AS OF MARCH 1978)
FOR MAJOR STREAMS IN THE PA ORBES REGION
SOURCE (11)

Drainage List (See Fig. 2.1.6.-9)	Stream	Zone	County	Water Uses Protected	Exceptions to Specific Criteria
Q	Allegheny River	Main Stem	Clarion	WWF	Add Ch_1 $MBAS_1$ and TON
	Tionesta Creek	Main Stem From Farnsworth Branch to Allegheny River	Forest	CWF	None
	Oil Creek	Main Stem	Venango	CWF	Add TON
	French Creek	Main Stem	Venango	WWF	Add $MBAS_1$ TON and Am_2
	Sugar Creek	Basin	Venango	CWF	Add Am_1
	Sandy Creek	Main Stem	Venango	WWF	Add Am_2
R	Clarion River	Main Stem	Clarion	CWF	Add TON
	Clarion River (East Branch)	Basin	Elk	HQ-CWF	Add TON
	West Branch Clarion River	Main Stem	Elk	CWF	Add TON
	Spring Creek	Basin	Elk	HQ-CWF	Add TON
	Toby Creek	Basin	Clarion	CWF	Add TON
S	Allegheny River	Main Stem	Armstrong	WWF; Add N	None
	Bear Creek	Main Stem	Armstrong	CWF	Add Am_1
	Redbank Creek	Main Stem	Armstrong	TSF	Add Am_1
	Sandy Lick Creek	Main Stem	Jefferson	TSF	Add Am_1
	Mahoning Creek	Main Stem	Armstrong	WWF	Add Am_2
	Little Mahoning Creek	Basin	Indiana	HQ-CWF	Add Am_1
	Cowanshannock Creek	Basin	Armstrong	WWF	Add Am_2
	Crooked Creek	Main Stem	Armstrong	WWF	Add Am_2
T	Kiskiminetas River	Main Stem	Armstrong	WWF	Add Am_2
	Conemaugh River	Main Stem	Westmoreland	WWF	Add Am_2
	Stony Creek	Main Stem from Source to Beaverdam Creek	Somerset	CWF	Add Am_1
		Main Stem from Beaverdam Creek to Quemahoning Creek	Somerset	TSF	Add Am_1

Drainage List (See Fig. 2.1.6.-9)	Stream	Zone	County	Water Uses Protected	Exceptions to Specific Criteria
T (Continued)	Stony Creek (Cont.)	Main Stem from Quemahoning Creek to Conemaugh River	Cambria	WWF	Add Am_2
	Two Lick Creek	Main Stem	Indiana	TSF	Add Am_1
	Loyalhanna Creek	Basin from Source to Laughlintown Run	Westmoreland	HQ-CWF	Add Am_1
		Main Stem from Laughlintown Run to Miller Run	Westmoreland	TSF	Add Am_1
		Main Stem from Miller Run to Kisiminetas River	Westmoreland	WWF	Add Am_2
U	Allegheny River	Main Stem from Redbank Creek to Kiskiminetas River	Armstrong	WWF; Add N	None
		Main Stem from Kiskiminetas River to Ohio River	Allegheny	WWF; Add N	Add TON
	Buffalo Creek	Basin From Source to Little Buffalo Creek	Butler	HQ-CWF	None
		Basin From Little Buffalo Creek to Allegheny River	Butler	TSF	None
	Deer Creek	Basin From Source to Little Deer Creek	Allegheny	CWF	None
		Basin from Little Deer Creek to Allegheny River	Allegheny	WWF	None
	Plum Creek	Basin	Allegheny	TSF	None
	Pine Creek	Basin from Source to North Park Lake Dam	Allegheny	CWF	Add P_1
		Basin from North Park Lake Dam to Allegheny River	Allegheny	TSF	Delete TDS_1 Add TDS_2
V	Monongahela River	Main Stem	Allegheny	WWF; Add N	Add TON
	Cheat River	Main Stem	Fayette	WWF	None

TABLE 2.1.6.-11 (continued)

Drainage List (See Fig. 2.1.6.-9)	Stream	Zone	County	Water Uses Protected	Exceptions to Specific Criteria
V (Continued)	Dunkard Creek	Main Stem	Greene	WWF	None
	Georges Creek	Main Stem	Fayette	WWF	Add Am_2
	Whiteley Creek	Basin	Green	WWF	Add Am_2
	Tenmile Creek	Basin from Source to South Fork Tenmile Creek	Greene	TSF	Add Am_2
		Basin From South Fork Tenmile Creek to Monongahela River	Greene	WWF	Add Am_2
	South Fork Tenmile Creek	Basin from Source to Browns Creek	Greene	HQ-WWF	Add Am_2
		Basin from Browns Creek to Tenmile Creek	Greene	WWF	Add Am_2
	Dunlap Creek	Basin	Fayette	WWF	Add Am_2
	Redstone Creek	Basin	Fayette	WWF	Add Am_2
	Peters Creek	Basin	Allegheny	TSF	None
	Youghiogheny River	Main Stem From Maryland-Pennsylvania State Line to Youghiogheny River Dam	Fayette	WWF	Delete $Temp_2$ Add $Temp_1$
		Main Stem From Youghiogheny River Dam to Connell Run	Fayette	HQ-CWF	None
		Main Stem From Connell Run to Monongahela River	Allegheny	WWF	None
	Casselman River	Main Stem	Somerset	WWF	None
	Laurel Hill Creek	Basin	Somerset	HQ-CWF	Add Am_1
	Indian Creek	Basin from Source to Champion Creek	Fayette	HQ-CWF	Add Am_1
	Jacobs Creek	Basin from Source to Bridgeport Reservoir Dam	Fayette	CWF	Add Am_1

TABLE 2.1.6.-11 (Continued)

Drainage List (See Fig. 2.1.6.-9)	Stream	Zone	County	Water Uses Protected	Exceptions to Specific Criteria
V(Continued)	Jacobs Creek (Continued)	Basin from Bridgeport Reservoir Dam to Youghiogheny River	Fayette	TSF	Add Am_2
	Sewickley Creek	Basin From Source to Brinkers Run	Westmoreland	HQ-CWF	None
		Main Stem from Brinkers Run to Youghiogheny River	Westmoreland	WWF	None
	Turtle Creek	Main Stem from Source to Brush Creek	Allegheny	TSF;Delete PWS	Delete TDS_1 Mn and Si Add TDS_2
		Main Stem from Brush Creek to the Monongahela River	Allegheny	WWF; Delete PWS	Delete TDS_1 Mn and Si Add TDS_2
	Abers Creek	Basin	Alleghenyn	TSF;Delete PWS	Delete TDS_1 Mn and Si Add TDS_2
W	Ohio River	Main Stem	Beaver	WWF; Add N	Shown Below

Exceptions to Specific Criteria for Ohio River Main Stem:

Delete: CN and F;

Add:

Ammonia - The concentration of un-ionized ammonia (NH_3) shall not exceed 0.05 mg/l as N.

Barium - Total barium shall not exceed 1.0 mg/l.

Cadmium - Total cadmium shall not exceed 0.01 mg/l.

Chloride - Chloride shall not exceed 250 mg/l.

Cyanide - Total cyanide shall not exceed 0.025 mg/l; free cyanide shall not exceed 0.005 mg/l.

Fluroide - Total fluoride shall not exceed 1.0 mg/l.

Nitrite - Nitrite shall not exceed 1.0 mg/l as N.

Selenium - Total selenium shall not exceed 0.01 mg/l.

Silver - Total silver shall not exceed 0.05 mg/l.

Radionuclides - Gross total alpha activity (including radium-226 but excluding radon and uranium) shall not exceed 15 picocurie per litre (pCi/l) and combined radium-226 and radium 228 shall not exceed 5 pCi/l; provided that specific determinations of radium-226 and radium-228 are not required if gross particle activity does not exceed 5 pCi/l. Concentration of total gross beta particle activity shall not exceed 50 pCi/l; the concentration of tritium shall not exceed 20,000 pCi/l; the concentration of total strontium-90 shall not exceed 8 pCi/l.

Mercury - Total organism body burden of any aquatic species shall not exceed 0.5 micrograms/gram as total mercury. Total mercury concentration (unfiltered) in any water sample shall not exceed 0.2 micrograms/liter.

TABLE 2.1.6.-11 (Continued)

Drainage List (See Fig. 2.1.6.-9	Stream	Zone	County	Water Uses Protected	Exceptions to Specific Criteria
W (Continued)	Ohio River (Continued)				PCB - Total PCB shall not exceed 1 nanograms per liter; however, when the level in water is less than the practical laboratory quantification level, a fish flesh body burden level in excess of 2 ppm shall be cause for concern and further investigation.
	Chartiers Creek	Main Stem	Allegheny	TSF	None
	Beaver River	Main Stem	Beaver	WWF; Add N	Add TON
	Mahoning River	Main Stem	Lawrence	WWF	Shown Below
	Exceptions to Specific Criteria for Mahoning River Main Stem: Delete: the entire list. Add: As, Ch_2, Cr, DO_2, F, Pb, Mn, N, S, $Temp_4$, TDS_1 pH - Not less than 6.0 and not more than 8.5. Total Iron - Not more than 1.0 mg/l. Threshold Odor Number - Not to exceed 24 at 60°C as a daily average. Total Cyanide - Not to exceed 0.025 mg/l.				Free Cyanide - Not to exceed 0.005 mg/l. Phenolics - Not to exceed 0.010 mg/l. Ammonia - Un-ionized ammonia not to exceed 0.02 mg/l. Cadmium - Not to exceed 0.01 mg/l (total). Total Chromium - Not to exceed 0.1 mg/l. PCB - Not to exceed 1 nanogram per liter. Copper - Not to exceed 0.02 mg/l (total). Nickle - Not to exceed 0.1 mg/l (total). Zinc - Not to exceed 0.2 mg/l (total)
	Shenango River	Main Stem from Pymatuning Dam to Beaver River	Lawrence	WWF	Add TON
		Main Stem from Source to Pymatuning Reservoir Dam	Crawford	WWF	Add Am_2
	Connoquenessing Creek	Basin from Source to Oneida Dam	Butler	HQ-WWF	None
		Main Stem from Lake Oneida Dam to Beaver River	Lawrence	WWF	None

TABLE 2.1.6.-11 (Continued)

Drainage List (See Fig. 2.1.6.-9)	Stream	Zone	County	Water Uses Protected	Exceptions to Specific Criteria
W(continued)	Slippery Rock Creek	Basin From Source to Muddy Creek	Lawrence	CWF	None
		Basin From Muddy Creek to Connoquenessing Creek	Lawrence	CWF	None
	Raccoon Creek	Main Stem	Beaver	WWF	None
L*	West Branch Susquehanna River	Main Stem		WWF	Add Am_2
	Chest Creek	Basin, Source to Patton Water Supply	Clearfield	HQ-CWF	Add Am_1
		Basin, Patton Water Supply to Mouth	Clearfield	CWF	Add Am_1
	Anderson Creek	Basin	Clearfield	HQ-CWF	Add Am_1
		Dubois Dam to Mouth	Clearfield	CWF	Add Am_1
	Clearfield Creek	Main Stem	Clearfield	WWF	Add Am_2
	Moshannon Creek	Main Stem	Clearfield-Centre	TSF	Add Am_1
	Bennett Branch Sinnemahoning Creek	Main Stem	Cameron	WWF	Add Am_2
N*	Raystown Branch Juniata River	Basin, Source to Somerset-Bradford County Line	Bedford-Somerset	CWF	None
Z*	Wills Creek	Main Stem, Source to PA MD Border	Bedford Somerset	CWF	Add Am_1

*Not in the Ohio River Basin

2.1.6.4 SURFACE WATER QUALITY

Natural variations in the quality of the surface waters of the ORBES Region in western Pennsylvania, caused by areal differences in geology and topography were further enhanced by concentration of population and industrial development during the last 150 years. Many of the streams have become severely polluted by sewage, industrial waste, and acid mine drainage while others were only mildly affected and a few escaped degradation.

Following the requirements of the 1972 Federal Water Pollution Control Act Amendments and the guidelines for waste effluent characteristics established by the U.S.E.P.A., the PA Department of Environemtnal Resources assessed the streams in Pennsylvania as to the limitations needed to meet water quality criteria and also assigned a priority value to each stream for abatement program purposes. This resulted in a classification system of streams consisting of three classes and three categories. Class is related to the type of problem in the stream or stream segment, category refers to the priority for abatement as defined below (2).

Class I designates "effluent limited" streams---those streams which can meet 1983 water quality criteria if minimum effluent treatment requirements are satisfied. (Designated by "EL" in subsequent Tables).

Class II - designates "water quality limited" streams---those in which the 1983 criteria will not be met unless effluent treatment or control beyond the minimum requirement is provided. ("WQL" in the Tables.)

Class III - designates "acid mine drainage affected" streams---those streams in which acid mine drainage prevents meeting the 1983 water quality criteria regardless of the treatment level of other effluents. (Designated by "AMD" in subsequent Tables).

In Category I, a significant portion of the segment has: (1) existing or potential point sources of pollution that would violate water quality standards with "best practicable treatment" in use, (2) relatively large population and industrial concentrations in relation to stream flows, (3) been identified as an area with very high growth and development potential, (4) high quality waters which need special protection, or (5) a combination of the above. Most Category I segments are water quality limited segments.

Category II segments have: (1) existing or point sources of pollution which will meet water quality standards with best practicable treatment, (2) been identified as areas with moderate or low growth and development potential, (3) have limited non-point source pollution from abandoned coal mine drainage, or (4) a combination of the above. Most Category II segments are effluent limited segments.

Category III segments have water quality problems caused by drainage from abandoned mines which will prevent attaining water quality standards even with "perfect" point source controls.

Due to accelerated protective measures, such as wastewater treatment and the control of acid mine drainage, several of the streams have shown considerable water quality improvement in recent years. There are programs underway or planned to correct pollution problems on many more streams and the stream miles meeting water quality criteria continue a positive trend. The 1978 Pennsylvania Water Quality Inventory Report (25) indicates that approximately 80 percent of the state's streams were meeting in 1977 the "fishable-swimmable" standards as established under the Federal Water Pollution Control Act, as amended. It was estimated that approximately 85 percent of the state's waters will meet the water quality standards by 1983, bacterial criteria not included.

Surface water quality problems associated with municipal waste, industrial waste, and acid mine drainage are discussed in more detail in Sections 2.1.6.5 and 2.1.6.6. In this section the general quality of the surface waters is described separately for the Monongahela, Allegheny, and Ohio River Mainstem Basins.

A. Monongahela River Basin

1. General

The surface waters of the Monongahela River Basin consist primarily of calcium sulfate waters whose chemical quality is influenced by pollution from acid mine drainage. The acid mine drainage from the bituminous coal fields underlying the area lowers the pH and causes high concentrations of free sulfuric acid, sulfate, and trace metals especially iron, aluminum, and manganese (14). The acid load carried into the Monongahela by its tributaries exceeds its neutralizing capacity. The bulk of the residual mineral acidity comes from the small streams tributary to the main stem, the principal tributaries contribute only 30% of the mineral acidity to the main stem (15). A study in 1963 found the Monongahela to be acid at all points examined with pH values less than 5.0. Most interstate tributaries were found acid also: the Cheat River and Dunkard Creek had pH values less than 5.0. Laurel Run in the headwaters of the Youghiogheny had an average pH value of 3.5. The Youghiogheny was alkaline at the state line but became acid downstream (16).

The acid conditions of the streams mask the effects of organic and bacterial pollution originating from municipal and industrial discharges. Coliform and fecal streptococci concentrations in the Monongahela were generally low and dissolved oxygen concentrations generally high in the 1963 study reflecting the inhibiting action of the acid conditions in the stream on micro-organisms. However, calculations indicated that under non-acid conditions and 1963 bacterial loads nowhere would the coliform densities drop to near the 1,000 per 100 ml level (16).

A 1964/65 study found significant increases in the lower reach of the Monongahela River in the following components: BOD, hardness, calcium, magnesium, sulfate, chloride, phenolics, total organic carbon, sodium, potassium, organic nitrogen and total solids. The increase in these components was attributed to municipal and industrial sources. The mean concentration of phenol was always higher than the recommended limit for drinking water (1 ppb) (17).

A 1971 evaluation found the quality of the Monongahela River improving due to better waste treatment at mines, industries, and communities. The pH and alkalinity have improved significantly at Charleroi and Braddock on the Monongahela

River and at Sutersville and Connellsville on the Youghiogheny River. Mine drainage from abandoned coal mines was the major source of water pollution in the Basin, discouraging pollution abatement. No significant improvement was found in the phenol problem (18). The Environmental Protection Agency estimated that approximately 2550 pounds per day of phenol was discharged to the Monongahela River in 1971 by industries located on its main stem. Significant amounts of BOD, oil, heat, suspended solids and cyanide discharged into the Monongahela River were found to contribute substantially to the water quality problems of the Ohio River. Use of the Monongahela for contact recreation in its headwaters near Pittsburgh has been limited by oil, scum, floating debris and dangerously high bacterial counts (19).

A 1973 water quality assessment indicated further improvement in the upper portions of the Monongahela River but less improvement in the lower portions (20). Nevertheless, data from 58 water quality monitoring stations in the Monongahela Basin during 1972-73 (21) indicated that state water quality criteria for pH, fecal coliform, and iron were often exceeded at several stations in the basin (22).

In the summer of 1975 the Corps of Engineers conducted two sampling surveys of the entire length of the Monongahela River: one at an extreme combination of low-flow conditions and high air temperatures and another at an intermediate flow. The results again demonstrated that pH related problems in the Monongahela River Basin have been considerably reduced in the previous few years by abatement of acid mine drainage. It was also found that most of the water quality problems on the Monongahela River mainstem are low-flow related and the navigation structures on the river have a noticable effect on several important water quality parameters. Consequently, low-flow augmentation from impoundments is an important factor along the entire length of the river (23).

There are four major reservoirs currently in operation in the Monongahela

River Basin (see Table 2.1.5.-8). Two of these, Deep Creek Lake on Deep Creek (tributary to the Youghiogheny River) in Maryland and Lake Lynn on the Cheat River in West Virginia, are owned by private power companies and are operated primarily to produce peak load power. The two other reservoirs, Tygart River Lake on the Tygart River in West Virginia and Youghiogheny River Lake on the Youghiogheny River at the Pennsylvania/Maryland border, are operated by the Corps of Engineers for flood control, recreation, and low-flow augmentation for water quality and navigation. Tygart River Lake is operated to provide a minimum flow of 340 cfs in the Upper Monongahela River and Youghiogheny River Lake provides a minimum flow of 200 cfs at Connellsville, Pennsylvania.

The influence on water quality of the power producing reservoirs is minor. Flow and temperature pulsations due to the releases from Deep Creek Reservoir can be noticed during low flows in the Youghiogheny River at Friendsville, Maryland (24) but these are absorbed by Youghiogheny River Lake. Youghiogheny River Lake is a relatively deep and cool impoundment exhibiting summer thermal stratification from which the outflow is cooler than the inflow in the spring and warmer than the inflow in the autumn. This alteration of the Youghiogheny River temperature is somewhat mitigated by the confluence of the warmer Casselman River only 1.2 miles downstream of the Dam, but so is the impact of the acid mine drainage polluted Casselman River. The low-flow augmentation provided by high quality water from Youghiogheny River Lake has a favorable impact not only on the temperature, pH, and acidity of the Youghiogheny River but it substantially mitigates the acid mine drainage, thermal pollution, and low dissolved oxygen concentrations in the lower Monongahela River and this mitigation is also significant to the water quality of the Upper Ohio River (24). The impact depends on the selective magnitudes of the release from Youghiogheny River Lake and the flows in Casselman, Cheat, Monongahela and Ohio Rivers.

The pH of the Monongahela River mainstem was judged good in 1975 even at low flow conditions (generally just slightly less than 7.0) except a 20 to 25 mile stretch immediately below the West Virginia border (23). The depression in pH in this reach is caused by the acid Cheat River and other acid discharges feeding into the Monongahela River. As a result, pH and acidity "are no longer crucial considerations in the water quality of the lower Monongahela River. However, high total dissolved solids (predominantly sulfates) remain a problem." (24)

Local water quality problems on smaller streams in the Monongahela River Basin will be pointed out in subsequent tables.

2. Surface Water Quality

The yearly averages and ranges of water temperature, conductivity, dissolved oxygen, and pH for the lower Monongahela River are shown in Figure 2.1.6.-10 as calculated from ORSANCO's Robot Monitor Computer Printouts (6). There is no definite trend in temperature, conductivity, and dissolved oxygen but the improvement in pH is conspicuous in the figure. Figure 2.1.6.-10A shows the seasonal variation of the average monthly values for the same four parameters.

Table 2.1.6.-12 gives twelve-year means of selectd parameters at the WQN Stations along the Monongahela and Youghiogheny Rivers as calculated by EPA's STORET System (1), (2). Mean, maximum and minimum values of 39 parameters for two successive three-year periods are given in Tables 2.1.6.-13 and 2.1.6.-13A.

Perhaps more informative are the results of a few recent studies by the Corps of Engineers and the PA-DER on the Monongahela River and some of its tributaries during critical summer conditions. Figures 2.1.6.-11 through 2.1.6.-19 show the profiles of surface water temperature, surface dissolved oxygen concentration, pH, conductivity, sulfates, nonfiltrable solids, transparency, NO_2 + NO_3, and

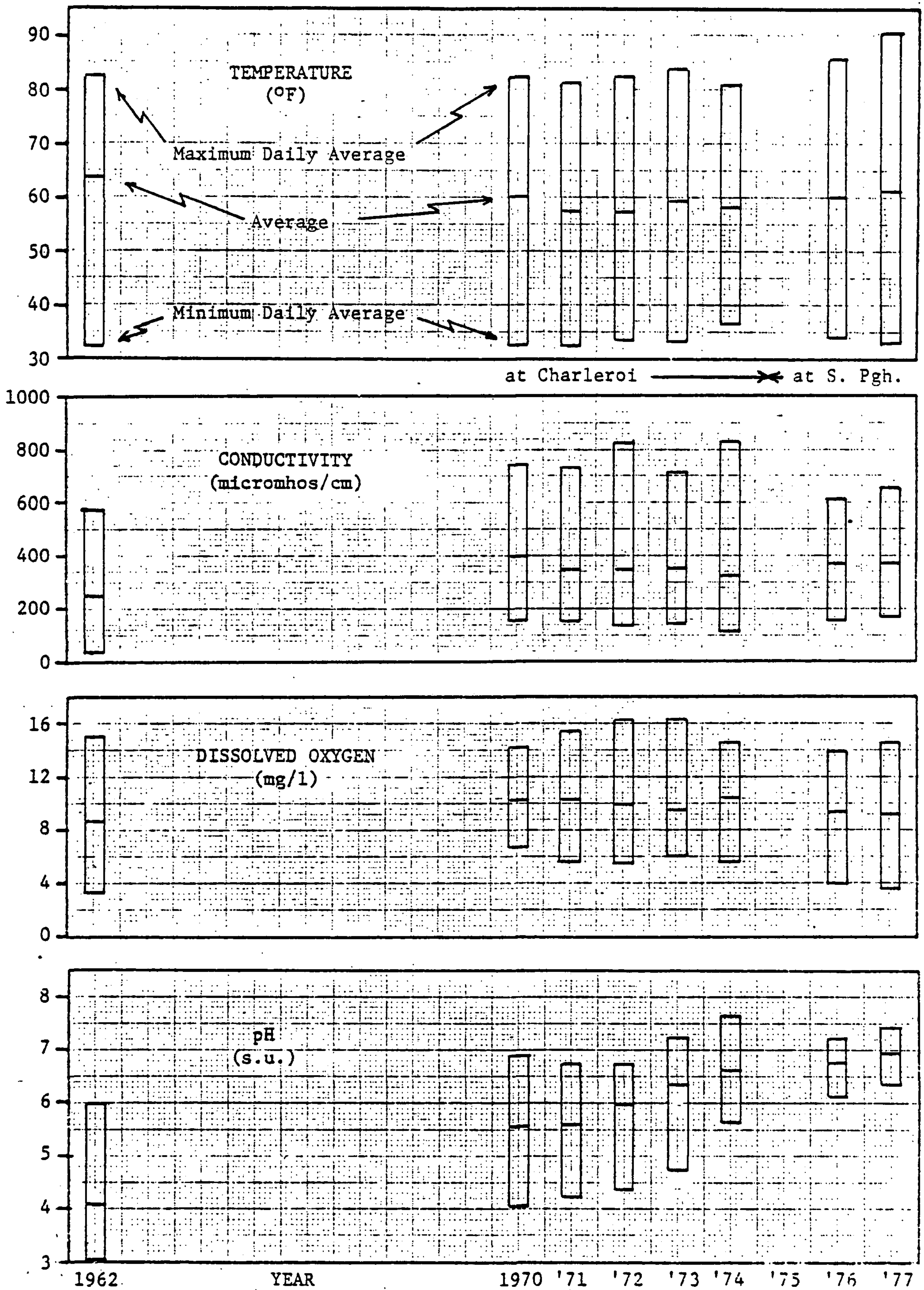


FIGURE 2.1.6.-10 ANNUAL WATER QUALITY -- MONONGAHELA RIVER Source (6)

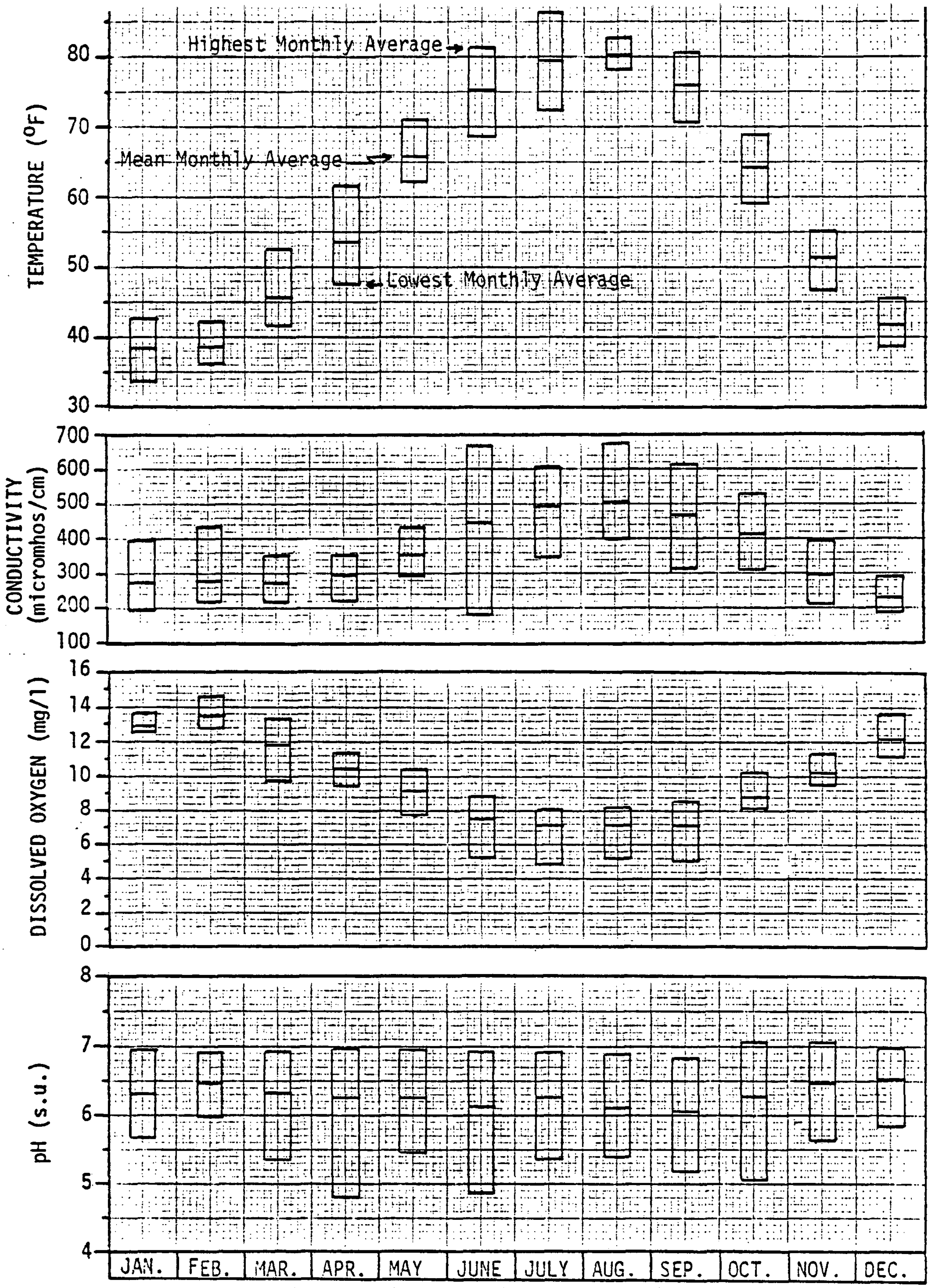


FIGURE 2.1.6.-10A SEASONAL VARIATION OF WATER QUALITY: MONTHLY AVERAGES MONONGAHELA RIVER, 1970-1977 After Source (6)

TABLE 2.1.6.-12

MEAN VALUES OF SELECTED PARAMETERS AT SAMPLING STATIONS IN THE MONONGAHELA RIVER BASIN

(Data collected from June 1962 to December 1974)

Source (2)

Parameter	Stream					
	Monongahela River			Youghiogheny River		
	Sampling Station (PA-DER WQN No.)					
	701	702	703	706	707	708
pH (S.U.)	6.2	5.3	4.7	6.3	6.7	6.6
Dissolved Oxygen (mg/l)	8.5	8.6	9.0	9.2	10.4	10.3
Total Iron (ug/l)	2,825	1,925	2,847	2,943	399	751
Total Dissolved Solids (mg/l)	115	145	34	81	22	64
Temperature (°C)	12.6	12.3	12.9	11.7	10.1	12.4
Turbidity (JTU)	18.1	21.8	17.0	26.3	13.1	11.2
Ammonia (mg/l N)	0.27	0.23	0.36	0.13	0.08	0.09
Total Phosphorus (mg/l P)	0.16	0.09	0.08	0.09	0.21	0.19
Alaklinity (as $CaCO_3$) (mg/l)	20.0	12.6	3.5	13.8	12.0	14.8
Biochemical Oxygen Demand (mg/l)	2.3	1.4	1.2	1.9	1.3	1.6
Total Coliform (#/100 ml)	31,900	11,200	1,500	22,600	6,000	4,800

TABLE 2.1.6.-13

MONONGAHELA RIVER WATER QUALITY (from EPA STORET System)

Source (22)

Parameter	Lock & Dam 7 at Greensboro, Pennsylvania 1/4/72 to 4/18/73				Charleroi, Pennsylvania 1/3/72 to 9/12/74				Pittsburgh, Pennsylvania 1/24/72 to 10/17/73			
	Number of Samples	Mean Value	Maximum Value	Minimum Value	Number of Samples	Mean Value	Maximum Value	Minimum Value	Number of Samples	Mean Value	Maximum Value	Minimum Value
Water Temperature, °C	10	13.5	24.5	1	7	12.3	25	2	14	18.6	31	4
Flow, cfs	-	-	-	-	3	3,633	4,700	2,400	13	9,859	29,000	3,650
Turbidity, JTU	3	0.5	1	0.1	8	5.8	23	0.5	11	11.5	45	4
Threshold Odor Number	1	24 (at 60°C)	24	24	1	33.2 (at 60°C)*	33.2	33.2	3	0 (at 40°C)	0	0
Conductivity at 25°C, micromhos/cm	4	304	543	173	7	326	600	150	14	423	650	85
Dissolved Oxygen, mg/l	9	10.6	17.8	5.0	7	10.9	13	7	14	8.9	12.1	5.5
Biochemical Oxygen Demand, 5 day, mg/l	2	0.8	1.2	0.4	1	1.8	1.8	1.6	14	1.8	3.2	0.6
pH, units	8	5.1*	6.5	1.3*	7	6.2	6.9	5.3*	14	6.5	7	6.1
Total Alkalinity, mg/l as $CaCO_3$	4	1.3	3	0	9	15.8	27	2	11	18.4	38	7
Total Acidity, mg/l as $CaCO_3$	5	7.6	14	2	-	-	-	-	11	4.5	14	0
Total Residue, mg/l	-	-	-	-	2	416	512	320	11	235.9	343	186
Ammonia Nitrogen, mg/l	1	0.36	0.36	0.36	8	0.23	0.58	0.06	14	0.73	1.3	0.12
Nitrate Nitrogen, mg/l	2	0.43	0.5	0.36	8	0.77	1.14	0.4	11	0.69	0.86	0.46
Total Phosphorus, mg/l	1	0.08	0.08	0.08	8	0.09	0.2	0.04	11	0.06	0.09	0.03
Orthophosphate, mg/l	3	0.15	0.43	0.003	1	0.005	0.005	0.005	-	-	-	-
Oil and Grease, mg/l	-	-	-	-	-	-	-	-	5	20.9	35	1.2
Total Organic Carbon, mg/l	6	3.8	5.5	2.0	1	3.5	3.5	3.5	14	2.8	8	1.1
Total Hardness, mg/l as $CaCO_3$	3	99.7	130	84	9	130.6	228	57	11	130.4	170	92
Chloride, mg/l	3	4.7	6	3	9	8.1	16	4	11	12.1	17	6
Sulfate, mg/l	3	85.7	108	63	9	131.4	273	42	11	136.8	210	85
Dissolved Fluoride, mg/l	1	0.01	0.01	0.01	1	0.01	0.01	0.01	11	0.26	0.44	0.1
Cyanide, mg/l	-	-	-	-	-	-	-	-	14	0.025	0.07	0.01
#Arsenic, mg/l	1	0.01	0.01	0.01	-	-	-	-	6	0.0017	0.01	0
Barium, mg/l	-	-	-	-	-	-	-	-	2	0.039	0.078	0
#Cadmium, mg/l	1	0.004	0.004	0.004	2	0.005	0.005	0.005	5	0.0008	0.004	0
#Chromium, mg/l	1	0.001	0.001	0.001	2	0.005	0.01	0	5	0	0	0
#Copper, mg/l	1	0.013	0.013	0.013	2	0.055	0.1	0.01	6	0.003	0.018	0
Iron, mg/l	2	0.63	1	0.26	10	0.818	2.74*	0.02	9	1.16	2.3*	0.018
Manganese, mg/l	2	0.51	0.52	0.49	3	0.820	1.19	0.63	9	0.52	1	0.2
#Lead, mg/l	1	0.005	0.005	0.005	2	0.050	0.050	0.050	6	0.005	0.013	0
#Zinc, mg/l	1	0.15	0.15	0.15	2	0.120	0.200	0.040	3	0.05	0.06	0.04
Mercury, mg/l	1	0	0	0	2	0.0005	0.0005	0.0005	5	0.0004	0.0013	0
Total Coliforms, no./100 ml	6	263	480	4	-	-	-	-	11	7,236	27,000	700
Fecal Coliforms, no./100 ml	7	50.4	193	0	-	-	-	-	11	308*	950*	10
Phenols, mg/l	-	-	-	-	2	0.003	0.005	0.001	11	0.012*	0.038*	0.001

#Dissolved component only at Lock & Dam 7 at Greensboro, Pennsylvania.

*Exceeds Pennsylvania's specific water quality criteria.

TABLE 2.1.6.-13A MONONGAHELA AND YOUGHIOGHENY RIVER WATER QUALITY, 1975-77 (From EPA's STORET System)

Parameter	WQN Station No. 701 Monongahela River at Braddock				WQN Station No. 703 Monongahela River Lock & Dam #7 at Greensburg				WQN Station No. 706 Youghiogheny River at Sutersville			
	No. of Samples	Mean Value	Maximum Value	Minimum Value	No. of Samples	Mean Value	Maximum Value	Minimum Value	No. of Samples	Mean Value	Maximum Value	Minimum Value
Water Temperature, °C	16	16.5	28.5	3.5	13	11.0	22.0	0	18	11.3	24.0	2.0
Flow, cfs	6	6,498	10,800	2,150	6	7,363	18,050	840	7	1,969	6,200	100
Turbidity, JTU	7	12.1	28.0	2.0	18	11.6	91.0	1.0	13	13.5	58.0	1.7
Conductivity at 25°C, micromhos/cm	16	411	600	200	20	290	500	161	23	259	450	130
Dissolved Oxygen, mg/l	16	9.2	12.3	6.9	5	10.8	12.2	8.7	5	10.3	13.0	8.8
pH, Standard Units	14	7.1	7.5	6.6	8	7.0	7.5	5.8	20	7.1	7.5	5.2
Total Alkalinity, mg/l as $CaCO_3$	16	29.9	54.0	15.0	22	14.3	30.0	2.0	24	18.5	40.0	7.0
Mineral Acidity, mg/l	15	0	0	0	14	0	0	0	24	0	0	0
Acidity from CO_2, mg/l	15	0	0	0	21	4.2	20.0	0	24	0	0	0
Total Residue, mg/l	--	--	--	--	--	--	--	--	--	--	--	--
Dissolved/105° Residue, mg/l	9	252	394	144	11	189	340	130	21	178	288	90
Total Nonfilterable Residue, mg/l	--	--	--	--	--	--	--	--	--	--	--	--
Settleable Residue, ml/l	--	--	--	--	--	--	--	--	--	--	--	--
Oil and Grease, mg/l	10	4.1	5.0	2.0	--	--	--	--	--	--	--	--
Total NH_3-N, mg/l	16	0.57	1.35	0.20	22	0.43	4.73	0.05	24	0.16	0.70	0.05
Total NO_2-N, mg/l	15	0.06	0.42	0.003	20	0.04	0.31	0.002	22	0.14	0.12	0.002
Total NO_3-N, mg/l	14	0.89	1.38	0.11	19	1.23	10.03	0.35	20	0.77	1.31	0.18
Total Phosphorus, mg/l P	16	0.83	9.59	0.02	22	0.19	1.31	0.02	24	0.13	0.78	0.02
Total Cyanide, mg/l	11	0.038	0.100	0.010	18	0.029	0.100	0.010	20	0.027	0.200	0.010
Total Hardness, mg/l as $CaCO_3$	15	127	170	74	22	105	195	40	24	85	129	30
Dissolved Calcium, mg/l	15	34.4	53.7	20.0	23	27.8	50.4	11.2	24	23.0	35.0	7.7
Dissolved Magnesium, mg/l	15	10.2	21.0	0	23	9.0	28.4	1.1	24	6.6	13.4	0.3
Chloride, mg/l	15	16.0	35.0	5.0	23	17.6	163	5.0	22	10.4	28.0	1.0
Total Sulfate, mg/l	16	123	220	40	23	107	235	42	23	70	145	20
Total Fluoride, mg/l	16	0.24	0.38	0.11	22	0.68	12.0	0.07	23	0.12	0.16	0.08
Total Arsenic, mg/l	--	--	--	--	--	--	--	--	--	--	--	--
Total Cadmium, mg/l	2	0.010	0.010	0.010	2	0.007	0.010	0.003	2	0.011	0.020	0.002
Total Chromium, mg/l	2	0.020	0.020	0.020	2	0.015	0.020	0.010	2	0.035	0.050	0.020
Total Copper, mg/l	2	0.015	0.020	0.010	2	0.010	0.015	0.005	2	0.030	0.050	0.010
Total Iron, mg/l	16	1.125	2.480	0.140	22	1.395	11.000	0.150	24	1.425	6.250	0.200
Total Lead, mg/l	2	0.050	0.050	0.050	2	0.038	0.050	0.025	2	0.125	0.200	0.050
Manganese, mg/l	15	0.267	0.380	0.100	2	0.365	0.500	0.230	24	0.203	0.400	0.040
Total Nickel, mg/l	2	0.050	0.050	0.050	2	0.038	0.050	0.025	2	0.038	0.050	0.025
Total Zinc, mg/l	2	0.120	0.200	0.040	2	0.260	0.495	0.025	2	0.030	0.030	0.030
Total Aluminum, mg/l	16	0.421	1.520	0.060	2	0.400	0.500	0.300	23	0.597	3.200	0
Total Coliforms, no./100 ml	--	--	--	--	1	80	80	80	--	--	--	--
Fecal Coliforms, no./100 ml	--	--	--	--	8	96	420	10	28	1,051	5,000	10
Total Phenols, mg/l	15	0.009	0.025	0.001	17	0.009	0.017	0.002	23	0.005	0.027	0.001
Total Mercury, mg/l	--	--	--	--	--	--	--	--	--	--	--	--

FIGURE 2.1.6.-11 MONONGAHELA RIVER SURFACE WATER TEMPERATURE

Source (23)

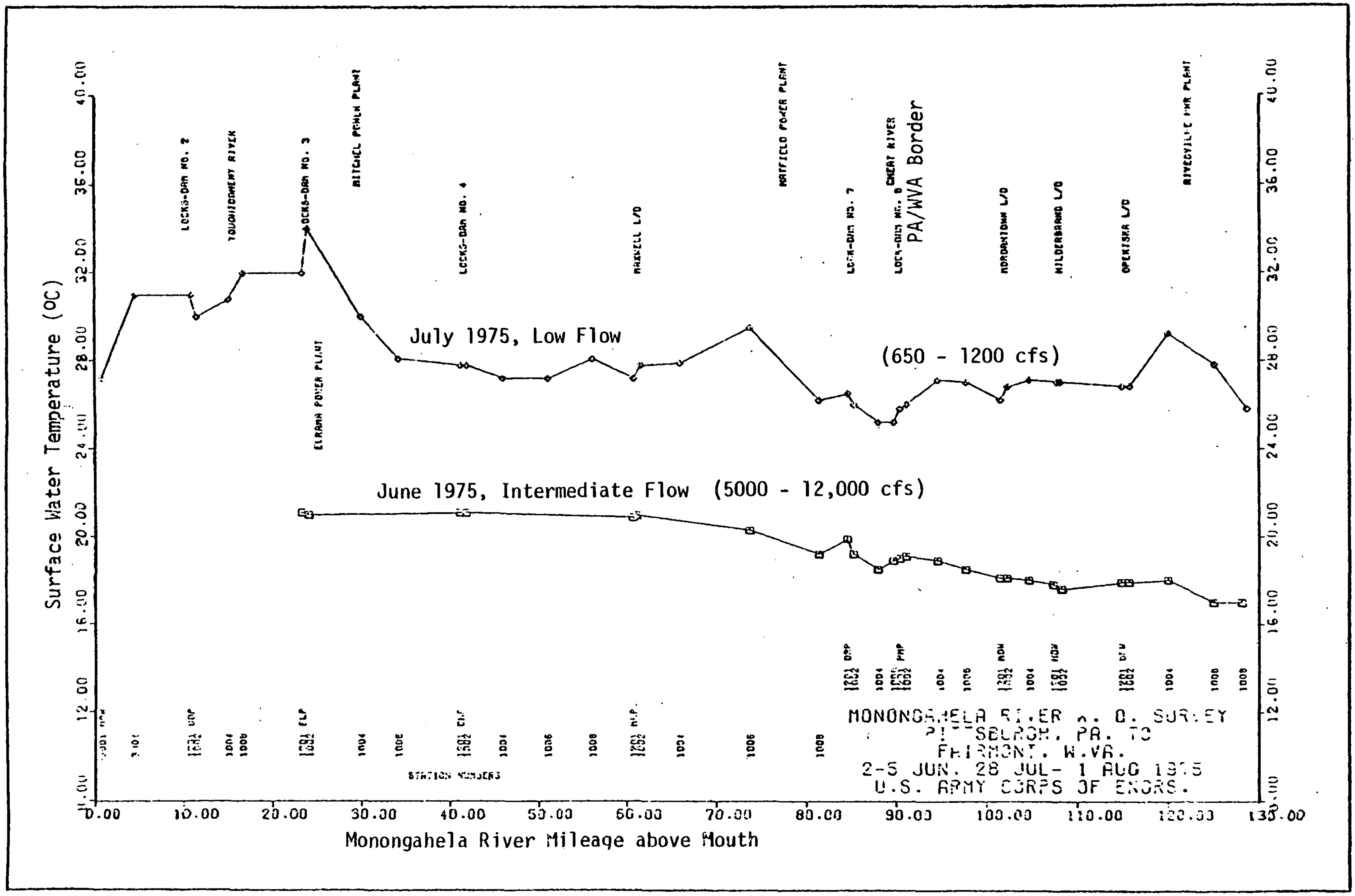


FIGURE 2.1.6.-12 MONONGAHELA RIVER SURFACE DISSOLVED OXYGEN CONCENTRATION

Source (23)

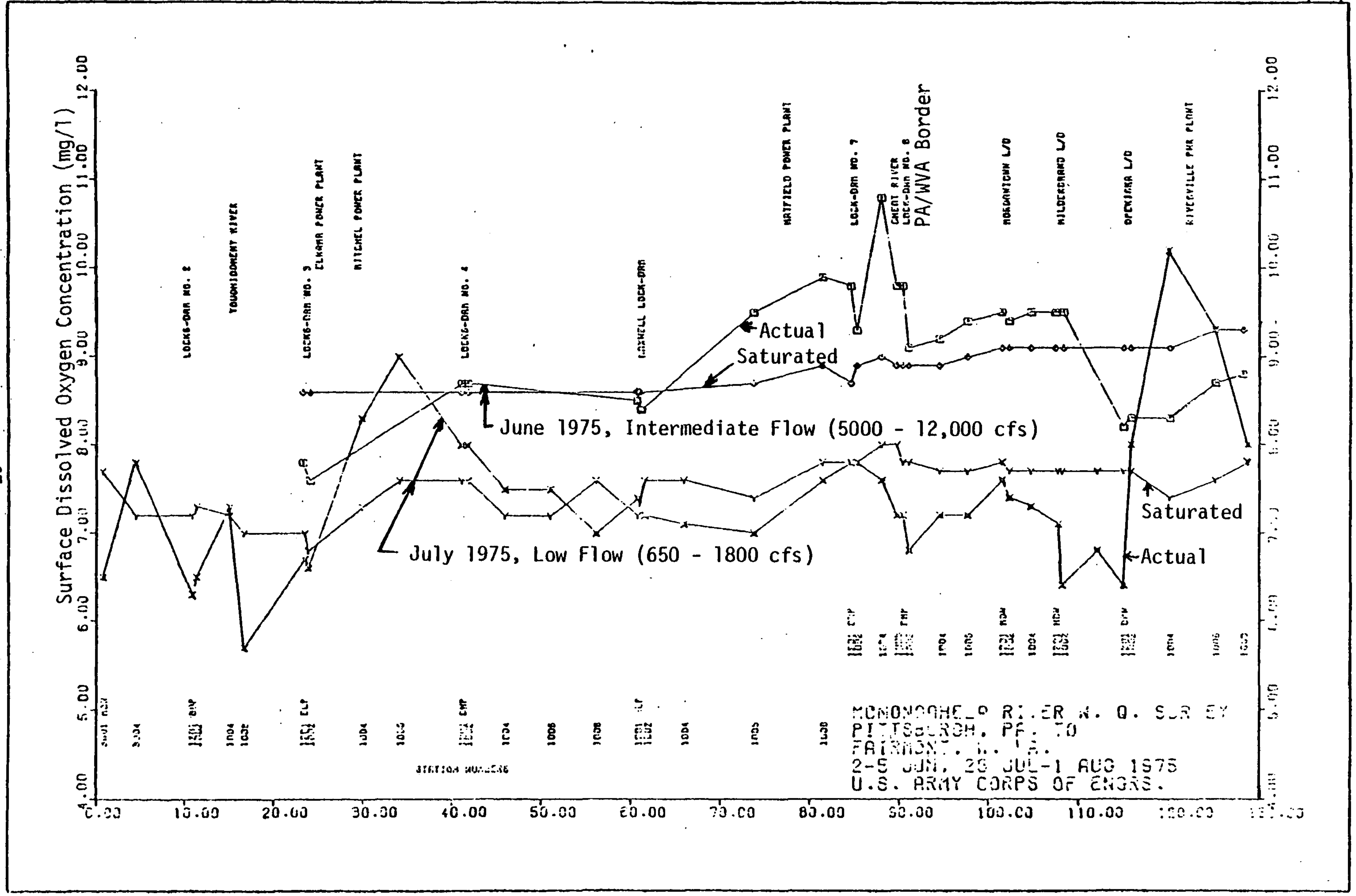


FIGURE 2.1.6.-13 MONONGAHELA RIVER SURFACE pH Source (23)

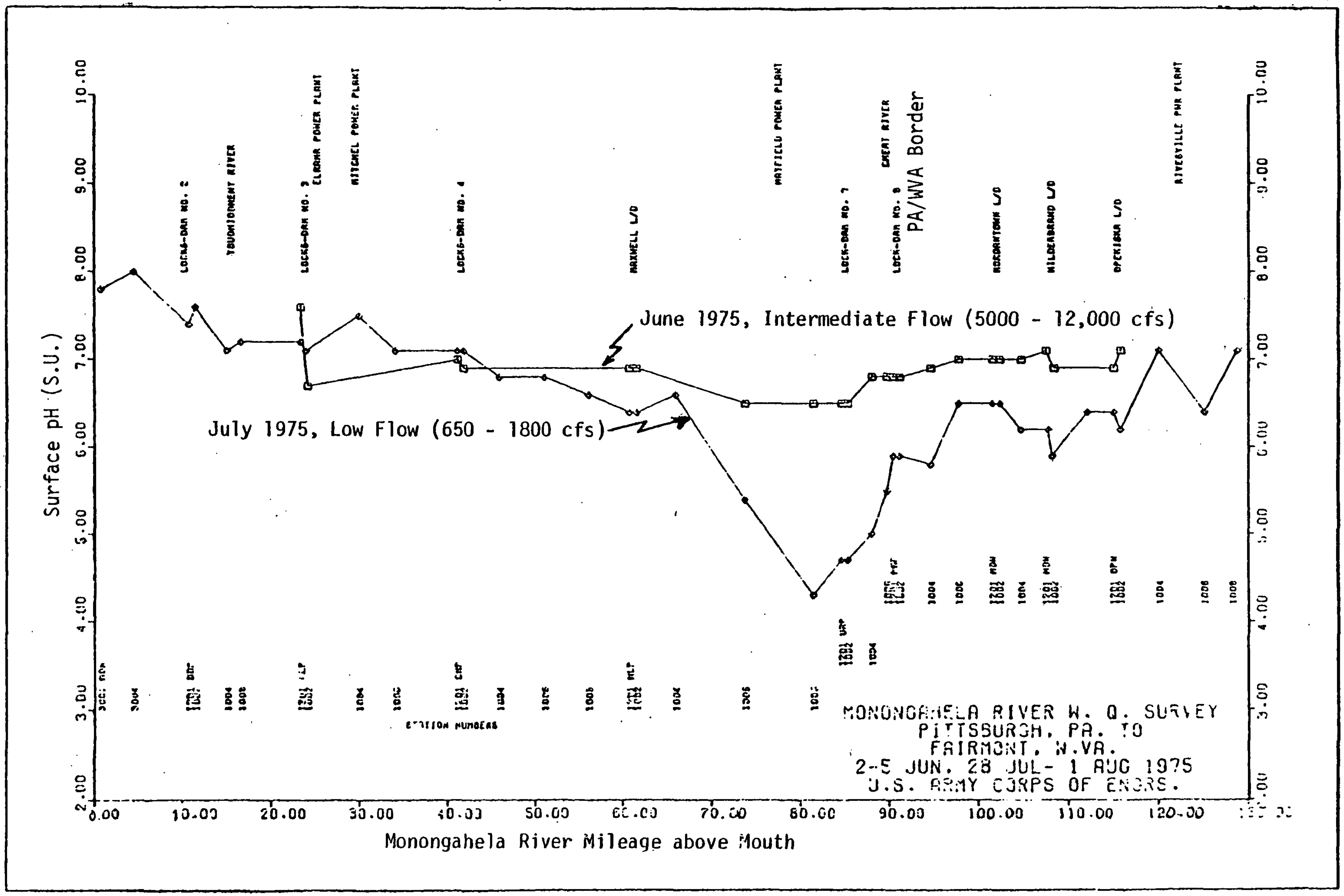


FIGURE 2.1.6.-14 MONONGAHELA RIVER CONDUCTIVITY (Midstream at Surface) Source (23)

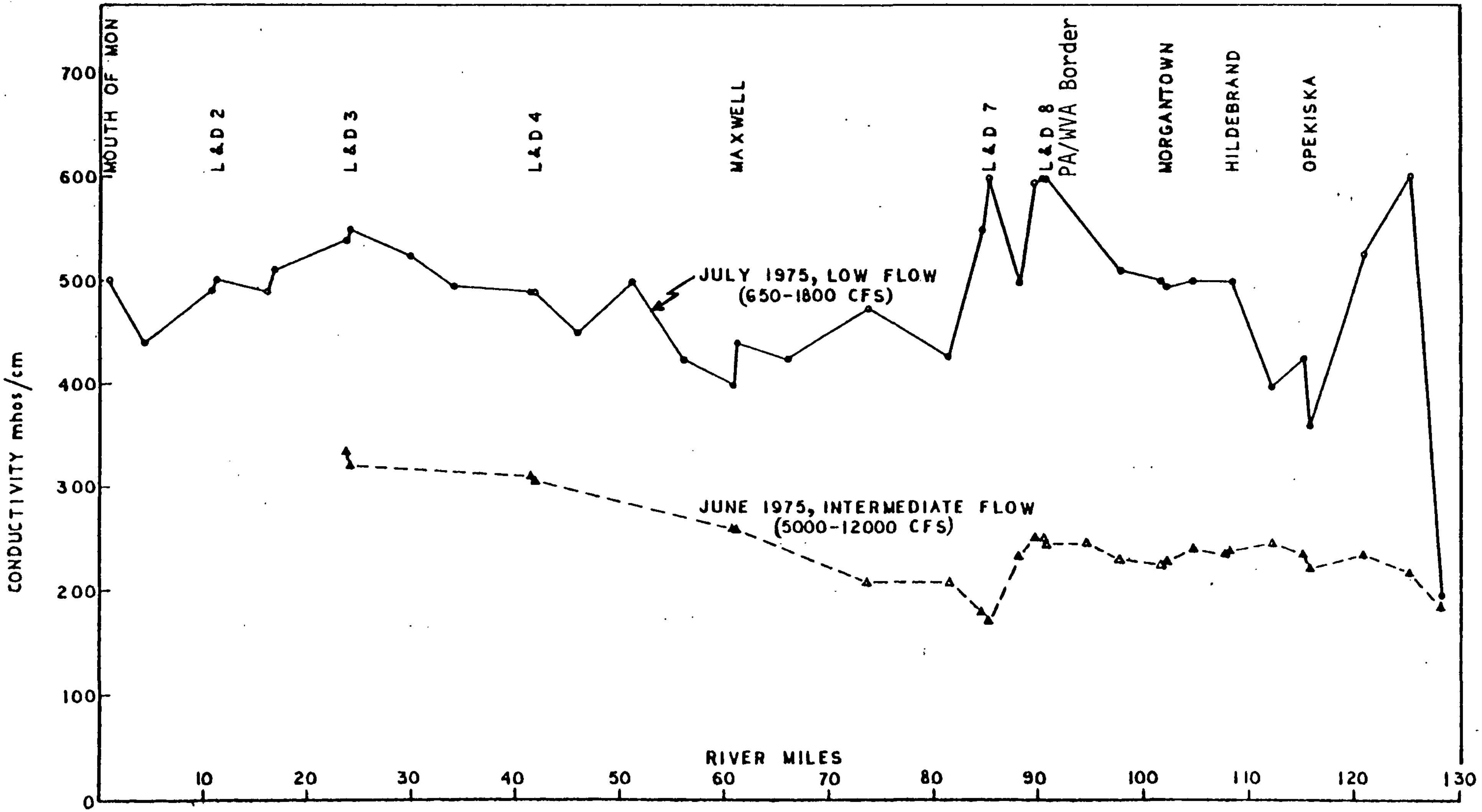


FIGURE 2.1.6.-15 MONONGAHELA RIVER SULFATES (Midstream at one meter depth) Source (23)

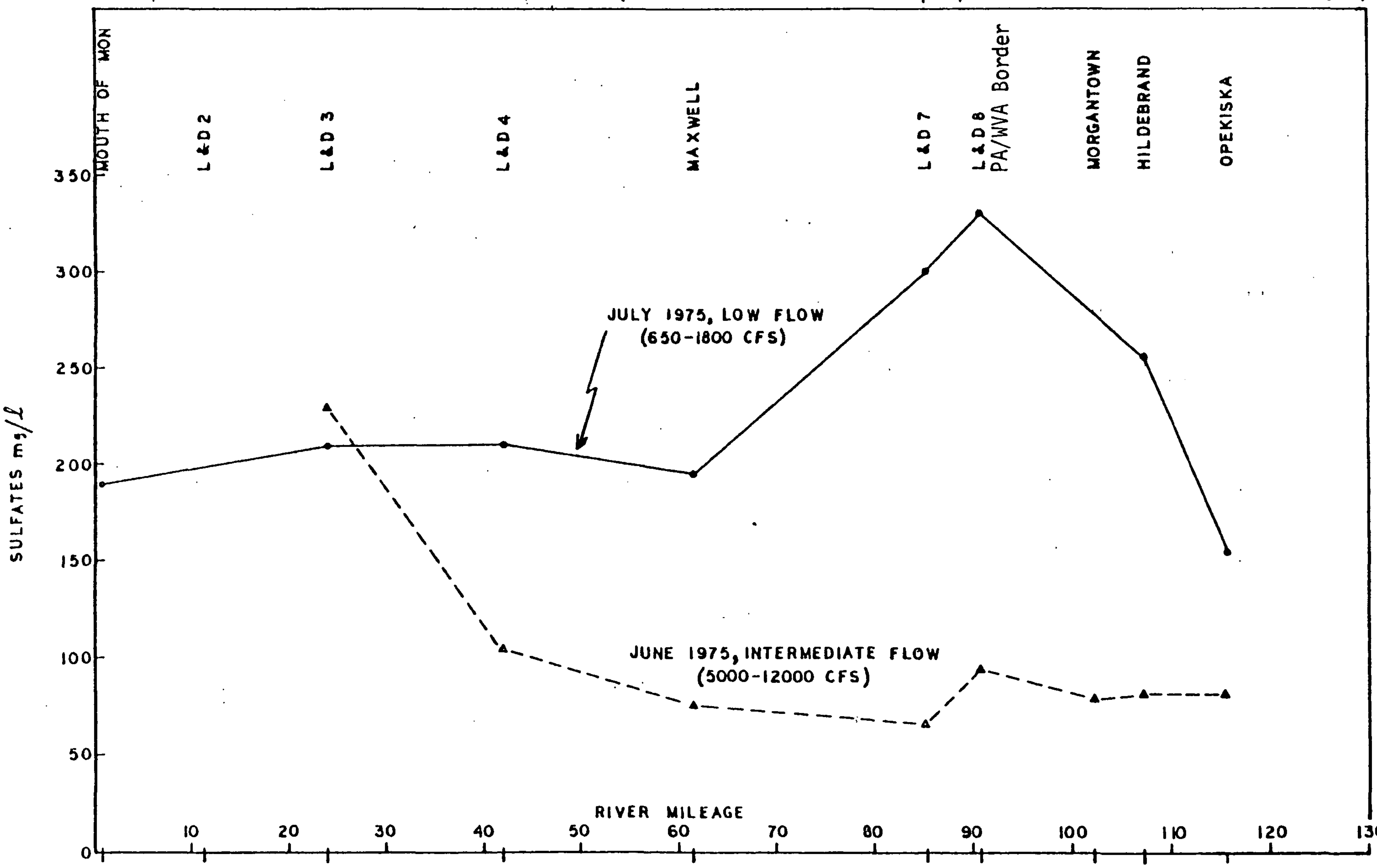


FIGURE 2.1.6.-16 MONONGAHELA RIVER NONFILTRABLE SOLIDS (Midstream at one meter depth) (Source (23))

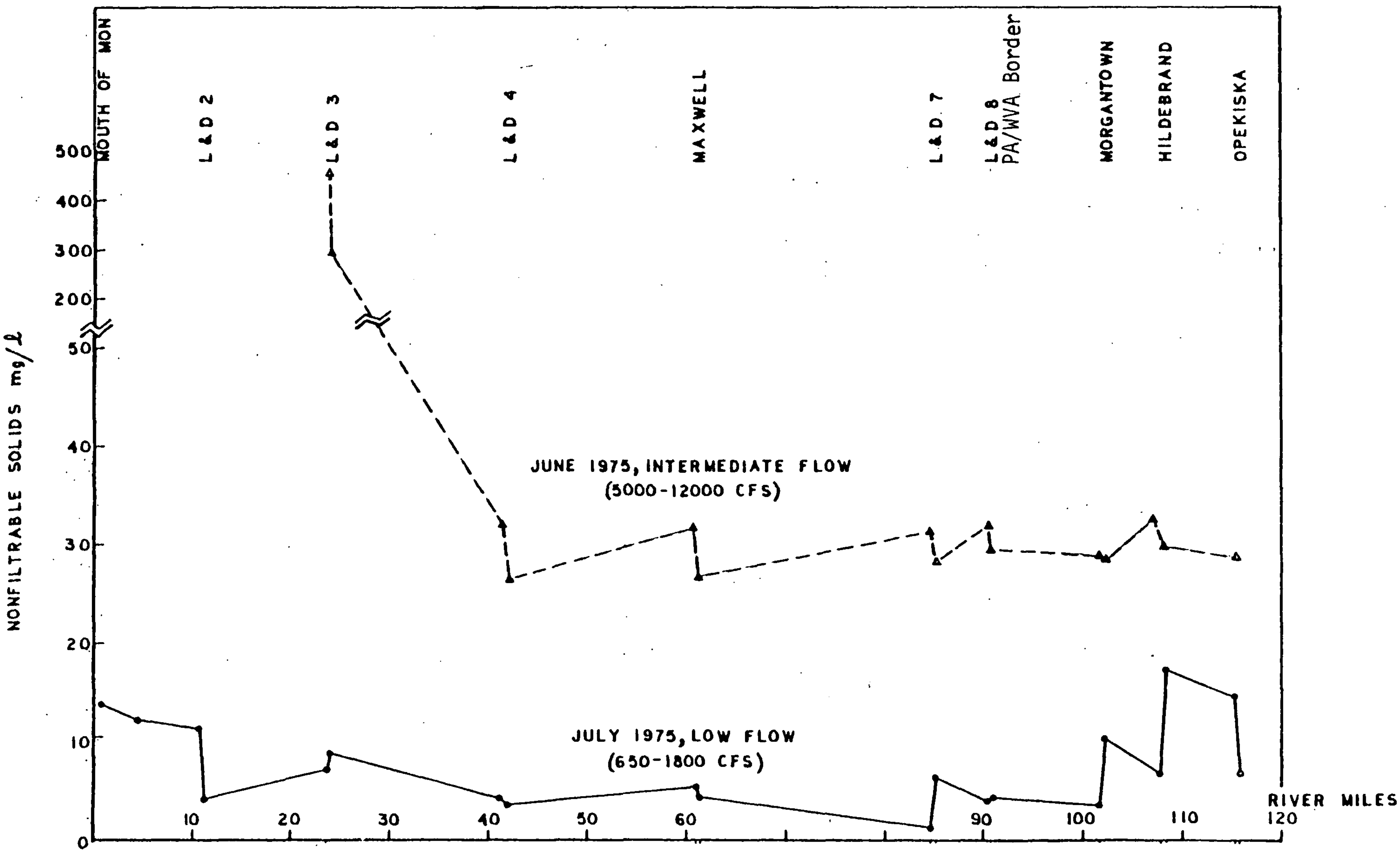


FIGURE 2.1.6.-17 MONONGAHELA RIVER TRANSPARENCY (Midstream) Source (23)

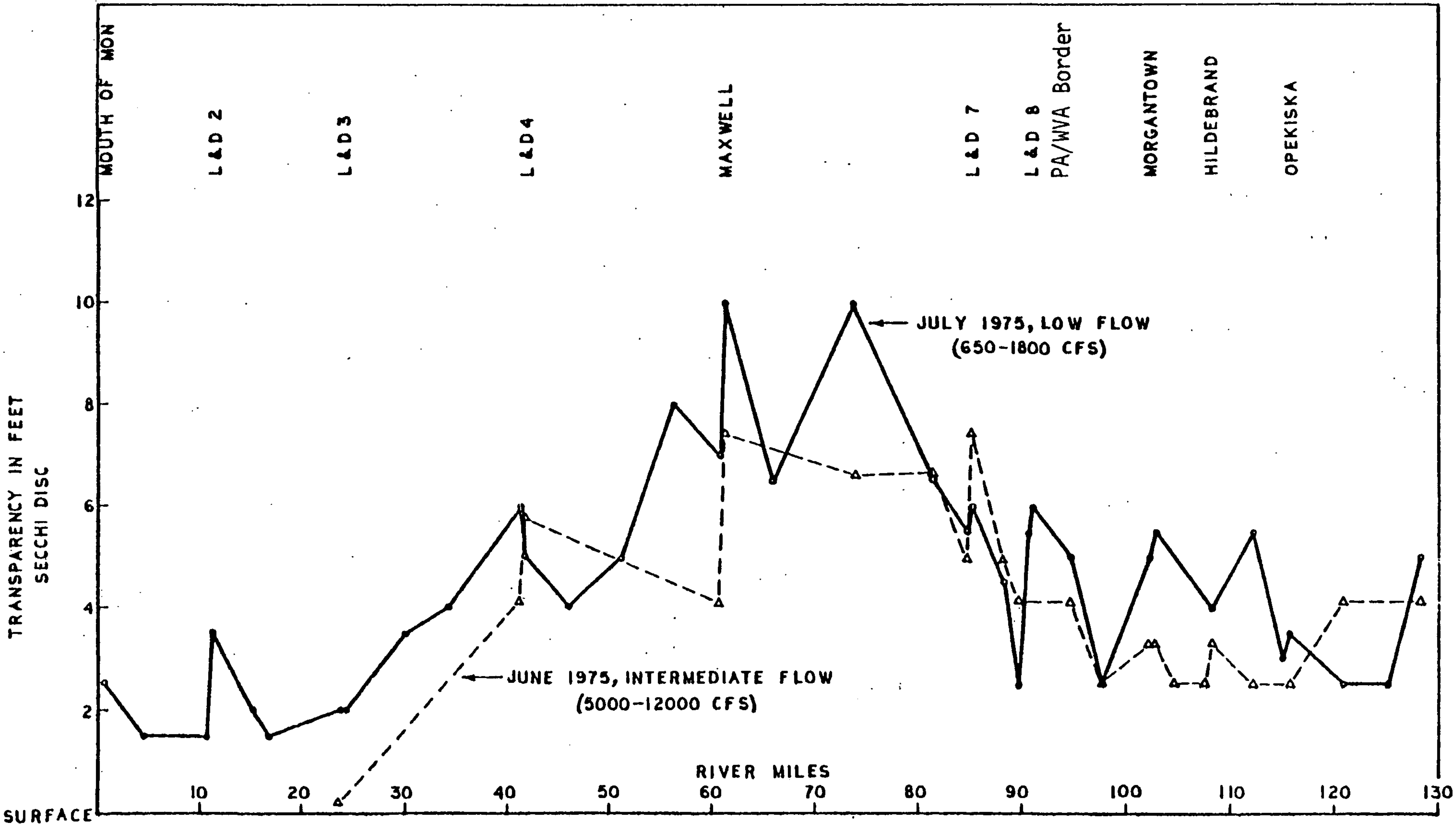


FIGURE 2.1.6.-18 MONONGAHELA RIVER NO_2+NO_3 (midstream at one meter depth) Source (23)

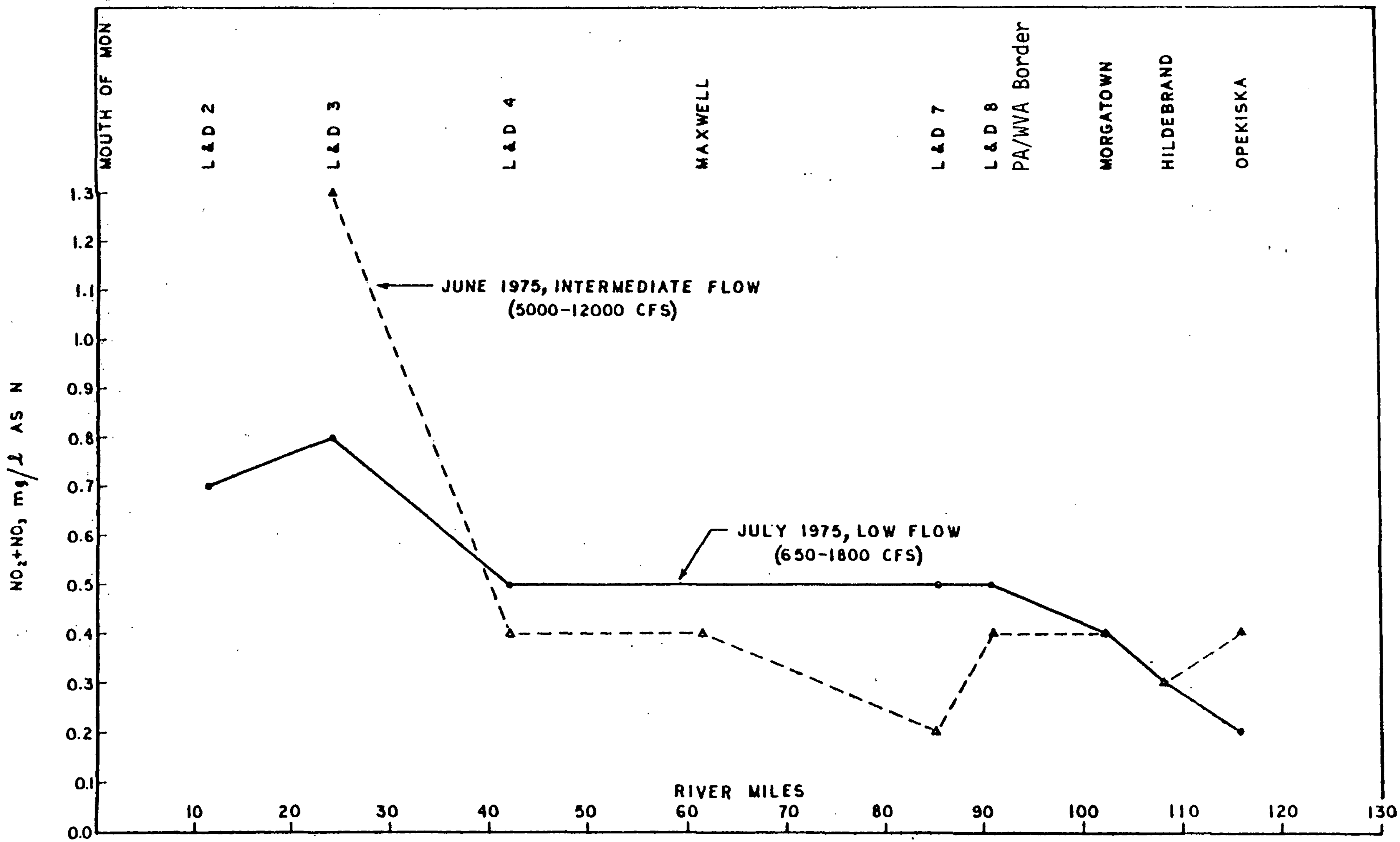
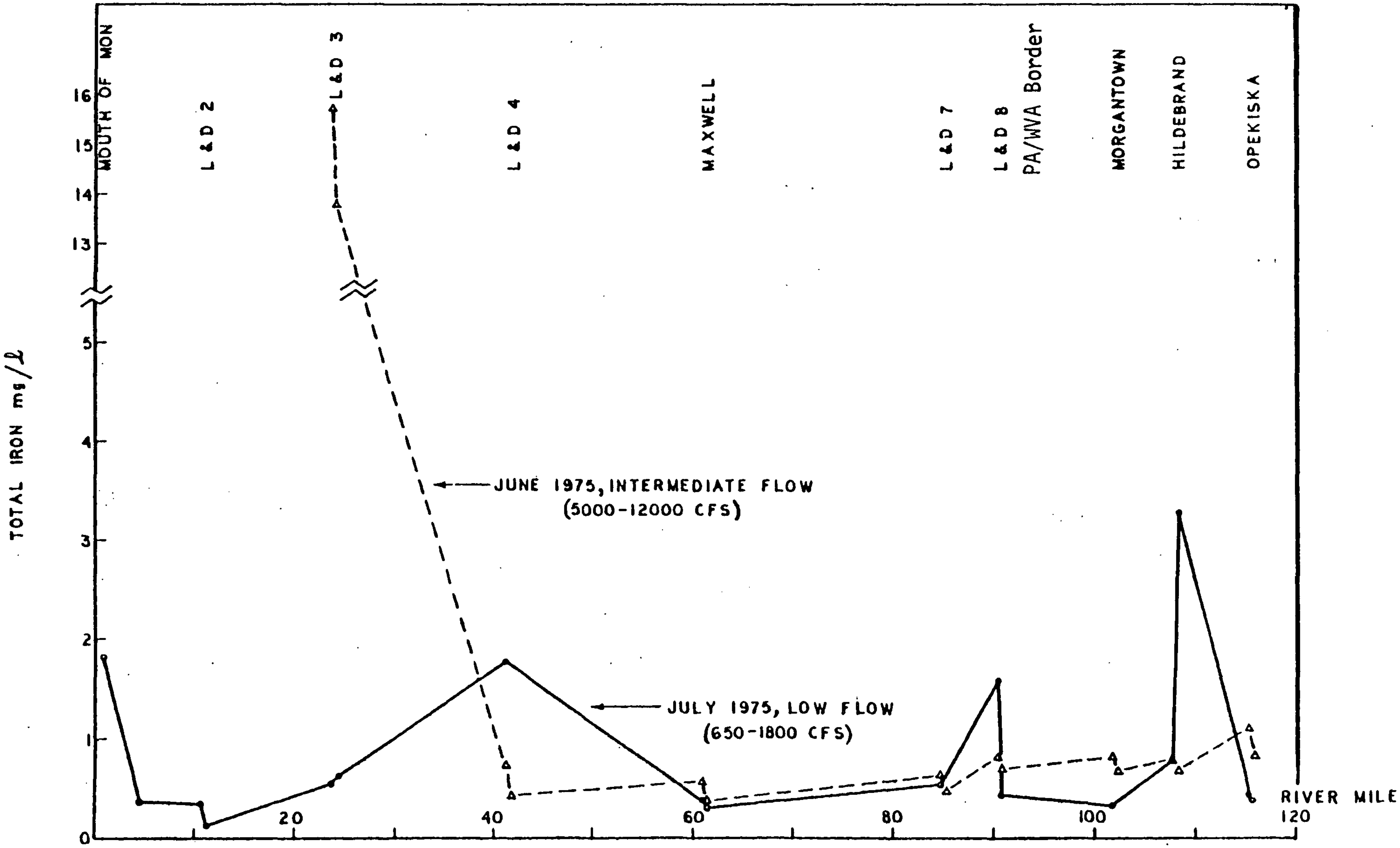


FIGURE 2.1.6.-19 MONONGAHELA RIVER TOTAL IRON (Midstream at one meter depth) Source (23)



total iron along the entire Monongahela River at two different flows (one low flow and one intermediate flow) in the summer of 1975. The effect on some of the parameters of the flow in the river as well as the impact of the Cheat and Youghiogheny Rivers is clearly discernible.

Figure 2.1.6.-20 shows the daily variation of Youghiogheny River water temperature at three locations in 1975. The cooling effect of low-flow augmentation from Youghiogheny River Lake is obvious.

The maximum, minimum and mean monthly pH of the Youghiogheny River at Connellsville, PA and the percent of flow at Connellsville contributed by the Casselman River is shown in Figure 2.1.6.-21 from 1953 through 1975. Longitudinal variation of several water quality parameters in April 1974 is shown in Figures 2.1.6.-22 and 2.1.6.-23 for the Casselman River and Laurel Hill Creek, respectively.

3. Water Quality Problems

Table 2.1.6.-14 presents the major quality problems, the courses and miles of streams degraded by those problems in the PA-ORBES Region as compiled from References (2), (25), and (26). The class and category assigned to the streams by DER is also given in the Table. Approximately half of the streams in the basin are beset by the acid mine drainage problem. Most of the rest of the streams are water quality limited and only a few are effluent limited.

The water quality of the main stem of the Monongahela River has deteriorated due to acid mine drainage, inadequately treated sewage, thermal pollution from power plants, and inadequately treated industrial waste. Waterways adversely affected by acid mine drainage include: Turtle Creek, Peters Creek, the main stem of the Youghiogheny River, Jacobs Creek, Jacobs Run, Indian Run, and the Casselman River. Pigeon Creek is affected by sewage discharges. Inadequately treated sewage, together with acid mine drainage, affects the quality in South

FIGURE 2.1.6.-20 YOUGHIOGHENY RIVER WATER TEMPERATURE 1975 Source (24)

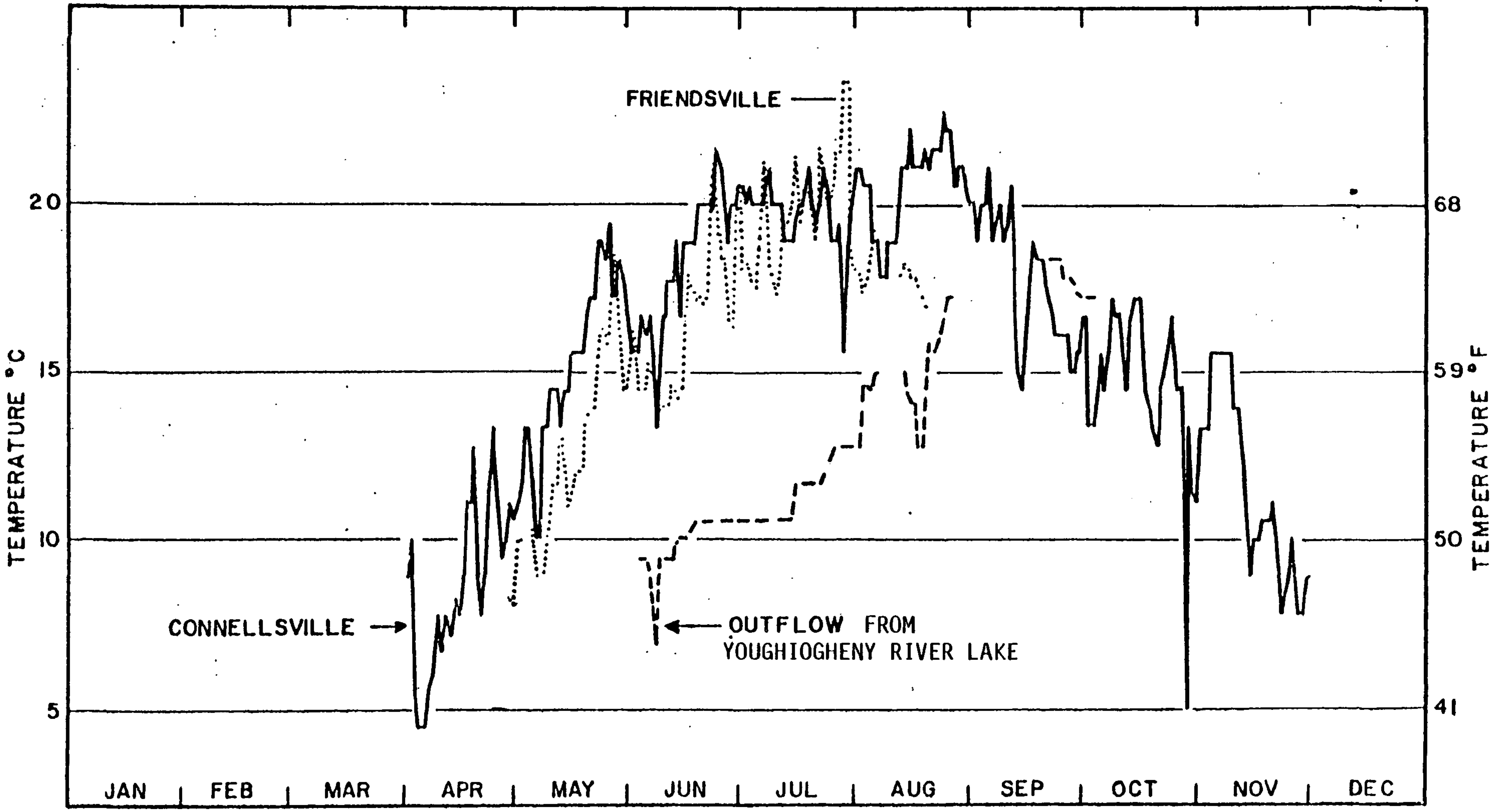
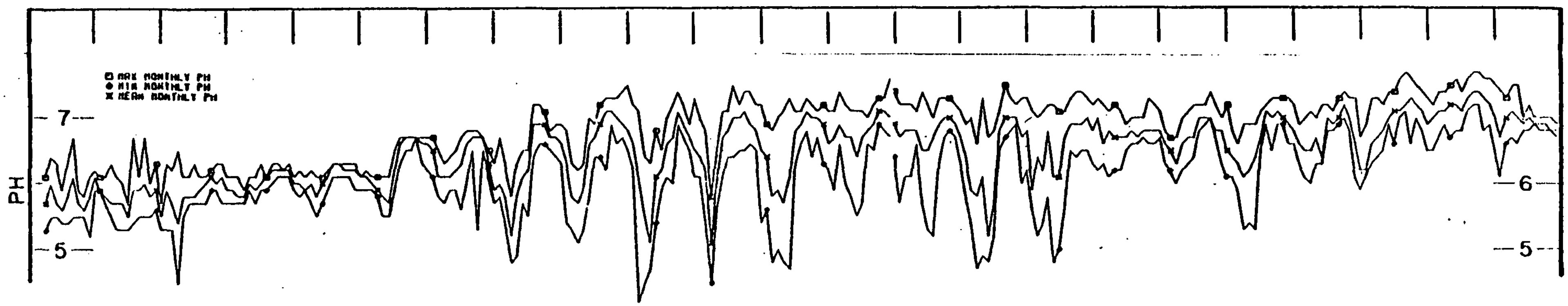


FIGURE 2.1.6.-21

Source (24)

MAXIMUM, MINIMUM, AND MEAN MONTHLY pH OF THE YOUGHIOGHENY RIVER AT CONNELLSVILLE, PA.



THE PERCENT OF FLOW AT CONNELLSVILLE CONTRIBUTED BY THE CASSELMAN RIVER (MARKLETON GAGE)

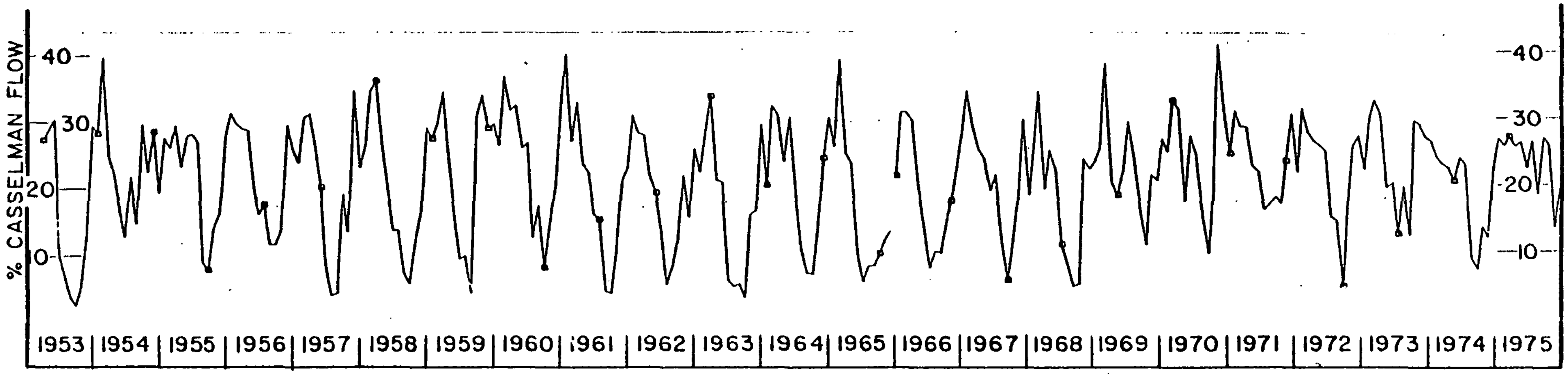


FIGURE 2.1.6.-22 SPATIAL WATER QUALITY PROFILE -- CASSELMAN RIVER, APRIL 1974 Source (3)

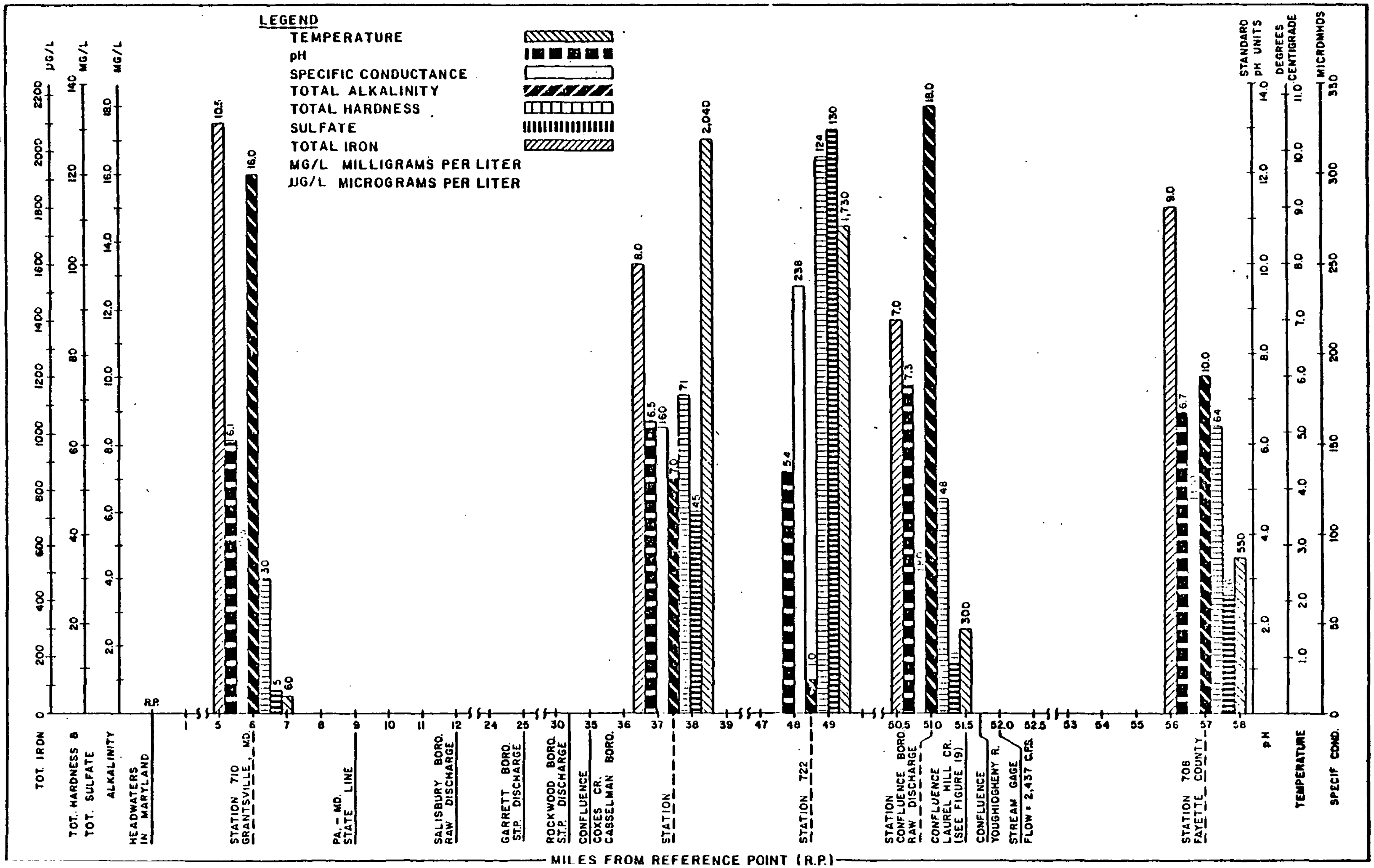


FIGURE 2.1.6.-23 SPATIAL WATER QUALITY PROFILE -- LAUREL HILL CREEK, APRIL 1974

Source (3)

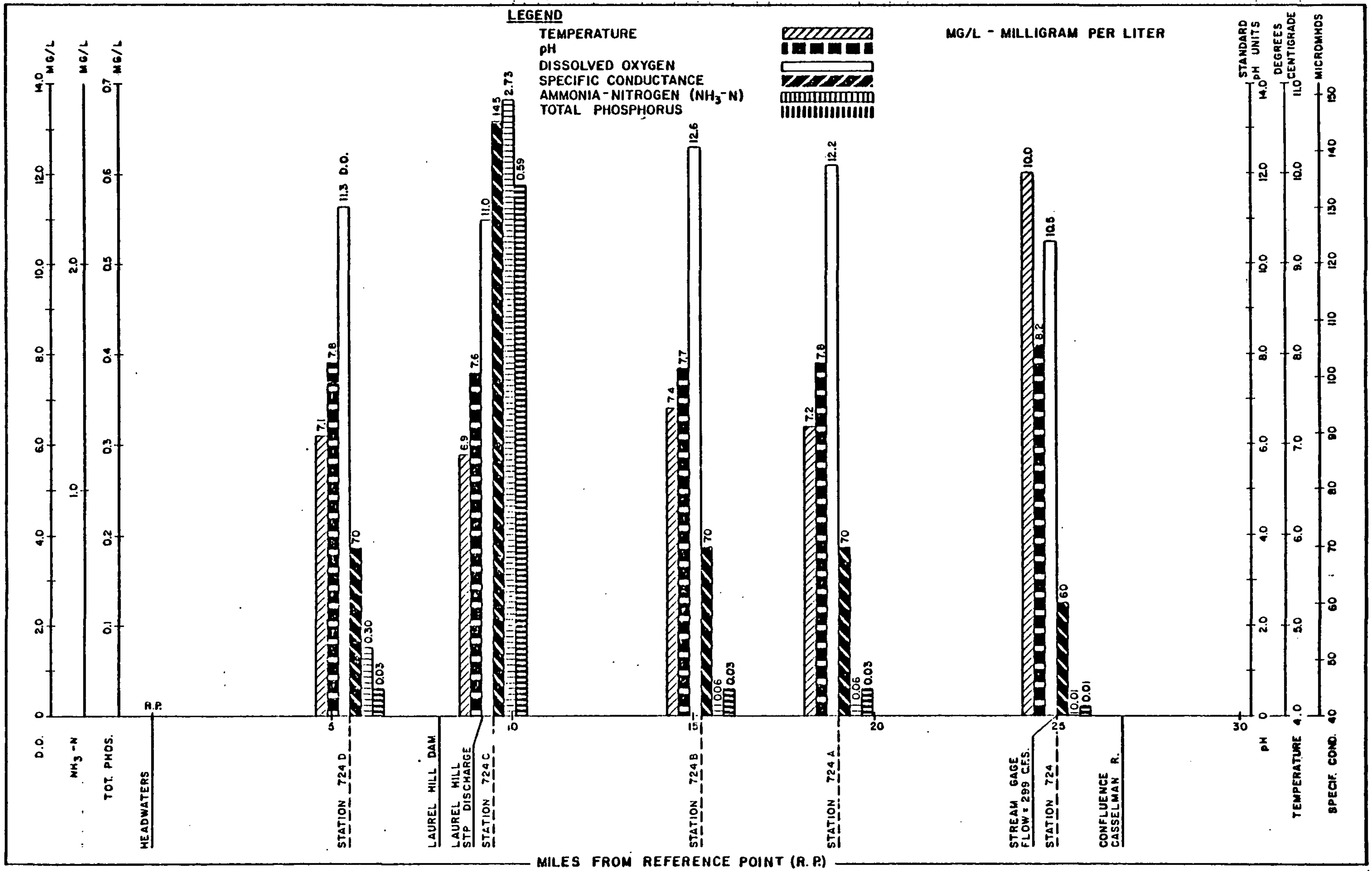


TABLE 2.1.6.-14 CLASSIFICATION AND QUALITY PROBLEMS OF MAJOR STREAMS - MONONGAHELA RIVER BASIN SOURCES (2), (25), (26)

Stream	Stream Segment	CO-WAMP Sub-Basin	Class (a)	Category (b)	Problems	Causes of Problems (Parameter Group Violation) (c)	Miles of Stream Degraded By Problems
Monongahela River	New Eagle to Point	19A	WQL	I	Cyanide; Oil; Possibly Heavy Metals; Possibly NH_3, Phenols, Iron	Water quality affected by municipal sewage and industrial waste discharges, thermal discharges from power generating plants, acid mine drainage from abandoned mines and urban runoff (1, 2, 3, 4, 5).	15
Turtle Creek		19A	WQL	I	BOD; Suspended Solids; Heavy Metals	Water quality adversely affected by high volumes of acid mine drainage and sewage (1, 2, 3, 4, 5).	30
Thompson Run		19A				Affected by industrial waste in head waters and acid mine drainage throughout the entire length (1, 4, 5).	6
Abers Creek		19A	WQL	I		Inadequately treated sewage	
Youghiogheny River	Sewickley Creek to Mouth	19D	WQL	I		Problems result from sewage, acid mine drainage, industrial wastes from tributaries and urban runoff. Amounts not significant to severely degrade the main stem (1, 2, 3, 4, 5).	12
Sewickley Creek	Main Stem; Buffalo Run to Mouth	19D	AMD	II		Headwaters excellent to Brinker Run; mine drainage enters from this point. Inadequately treated sewage enters from Jacks Run (1, 2, 3, 4, 5).	23
Sewickley Creek	Entire Watershed above and including Buffalo Run	19D	WQL	I	Heavy Metals; Oil		
Little Sewickley Creek		19D				Water quality affected by sewage in Hermine area (2, 3, 4).	3
Youghiogheny River	Watershed above Sewickley Creek	19D	EL	II		Minor problems, acid mine drainage and sewage in tributaries. Amounts not significant to degrade main stem (1, 2, 3, 4, 5).	18
Jacobs Creek	Mt. Pleasant-Scottsdale Area, including Stauffer Run and Sherrick Run	19D	WQL	II	BOD; NH_3; Suspended Solids; Heavy Metals; Oil	Inadequately treated sewage and mine drainage entering from some tributaries (1, 2, 3, 4, 5).	12
Indian Creek	Champion Creek to Mouth	19E	AMD	II		Concentrated mine drainage from deep and strip mines appears to be degrading tributaries (1, 4, 5).	4
Rasler Run	Entire Watershed	19E	AMD	II			
Poplar Run	Entire Watershed	19E	AMD	II			
Champion Creek	Entire Watershed	19E	AMD	II			
Casselman River		19F	AMD	II		Portions degraded due to raw sewage discharges and acid mine drainage (1, 2, 3, 4, 5).	28

TABLE 2.1.6.-14 (Continued)

Stream	Stream Segment	CO-WAMP Sub-Basin	Class (a)	Category (b)	Problems	Causes of Problems (Parameter Group Violation) (c)	Miles of Stream Degraded By Problems
Laurel Hill Creek		19E				Untreated sewerage affects water quality in Jefferson Twp. area. Remainder of the stream is in good to excellent condition (2, 4).	2
Coxes Creek		19F				Water quality degraded due to inadequately treated municipal and industrial wastes and acid mine drainage (1, 2, 3, 4, 5).	3
Peters Creek		19C	WQL	I		High volumes of sewage in main stem, acid mine drainage in some tributaries (1, 2, 3, 4, 5).	6
Monongahela River	Monessen to New Eagle	19C	WQL	I	Cyanide; Oil; Possibly Heavy Metals; Possibly NH_3	Major problems as a result of inadequately treated industrial waste, thermal pollution, sewage and some acid mine drainage (1, 2, 3, 4, 5).	13
Monongahela River	W. Va. Border to Monessen	19 B,C,G	EL	II		Major water quality problem result from mine drainage, inadequately treated raw sewage, thermal pollution and inadequately treated industrial wastes (1, 2, 3, 4, 5).	25
Pigeon Creek	Headwaters to Bentleyville	19C	WQL	I	Iron; Sulfate; BOD; NH_3; Suspended Solids	Problems associated with inadequately treated municipal wastes (2,4).	5
Pike Run		19C				Currently this stream is trout stocked but exhibits minor water quality problems due to untreated sewage and acid mine drainage. Neither is of sufficient quality to degrade the main stem (1, 2, 4, 5).	4
Redstone Creek	Phillips to Mouth	19C	WQL	II	BOD; NH_3; Suspended Solids; Oil	Inadequately treated sewage at Uniontown. Further degradation from acid mine drainage eliminates virtually all stream life (1, 2, 3, 4, 5).	10
Bolden Run	Entire Watershed	19C	AMD	II			
Bute Run	Entire Watershed	19C	AMD	II			
Rankin Run	Entire Watershed	19C	AMD	II			
Redstone Creek	Entire Watershed above Phillips	19C	AMD	II			
Dunlap Creek		19C				Headwater area affected by acid mine drainage and sewage. Recovery occurs near mouth (1, 2, 4, 5).	5
Tenmile Creek	Entire Watershed above South Fork	19B	WQL	II	Suspended Solids; Iron		

TABLE 2.1.6.-14 (Continued)

Stream	Stream Segment	CO-WAMP Sub-Basin	Class (a)	Category (b)	Problems	Causes of Problems (Parameter Group Violation) (c)	Miles of Stream Degraded By Problem
South Fork Ten-mile Creek		19B	WQL	II	BOD; NH_3; Suspended Solids	Stream degradation due to inadequately treated and raw sewage and mine drainage from abandoned mines (2, 3, 4),	10
Muddy Run		19B	WQL	II		Inadequately treated sewage, acid mine drainage.	
Little Witley Creek	Main Stem	19B	AMD	II			
Whiteley Creek	Mapletown to Mouth	19G	AMD	II	Suspended Solids	Mine drainage from strip mines and abandoned mines (1, 4, 5).	10
Cats Creek	Entire Watershed	19G	AMD	II			
Jacobs Creek	Entire Watershed	19G	AMD	II			
Georges Creek	York Run to Mouth	19G	AMD	II		Sewage in headwaters, severe acid mine drainage from confluence with York Run to mouth (1, 2, 3, 4, 5).	12
York Run	Entire Watershed	19G	AMD	II			
Dunkard Creek	State Line to Mouth	19G	WQL	II		Stream degradation due to mine drainage, inadequately treated sewage and industrial wastes (1, 2, 4, 5).	10
Cheat River	State Line to Mouth	19G	AMD	II			
Big Sandy Creek		19G	WQL	II			

NOTES:

(a) CLASSES:

WQL = Water Quality Limited Stream
EL = Effluent Limited Stream
AMD = Acid Mine Drainage Affected Stream

(b) CATEGORIES:

See definition in Section 2.1.6.4.

(c) PARAMETER GROUPS:

1 = Harmful substances (heavy metals, chemicals, pesticides, other toxins)
2 = Oxygen depletion
3 = Eutrophication potential (phosphorus, nitrogen)
4 = Physical modification (temperature, turbidity, suspended solids, color, flow)
5 = Salinity, acidity, alkalinity (conductivity, pH, alkalinity, total dissolved solids)

Fork-Tenmile Creek, Muddy Run, Georges Creek, Dunkard Creek, Pike Run, Dunlap Creek and portions of Casselman River, Redstone Creek and Sewickley Creek. Long Run has a siltation problem (27).

4. Compliance Status

Table 2.1.6.-15 presents the 1974 state water quality criteria for the water quality network stations in the Monongahela River Basin along with a comparison of the means and maximum values of the various water quality parameters with those criteria (2). Although the 1974 water quality standards have been recently proposed for revision (see Section 2.1.6.3) and the evaluation may soon be outdated, the Table reveals the major problem areas in complying with the standards. The designation "OK" in Columns (9) through (20) means that the value of the parameter satisfies the water quality criteria for that stream; however, it does not imply that the stream consistently meets water quality criteria. The actual concentrations listed do not meet stream criteria. In addition to the concentrations of the five specific water quality parameters specified for all streams by DER (pH, dissolved oxygen, total iron, temperature, and total dissolved solids), odor and total coliform bacteria, and potential water quality problems are noted.

According to a recent report (29) about half of the Monongahela River Basin's major streams met water quality standards in 1977. Within the basin, however, only about one-sixth of the Turtle Creek watershed met the standards, while over a third of the main stem of the Monongahela and three-quarters of the Youghiogheny, Indian, and Little Sewickley Rivers are satisfactory.

Column (21) summarizes the overall quality rating of the streams by DER and the PA Fish Commission for 1974-75 (26). In Column (22) the water quality conditions are projected to 1983 and the problems which are expected to prevent attainment of the 1983 goals are listed (25). DER estimates that South Fork Tenmile Creek, Pigeon, Peters, and Laurel Hill Creeks will probably meet standards within the next five years.

TABLE 2.1.6.-15 COMPLIANCE STATUS 1975 - MONONGAHELA RIVER BASIN SOURCES (2), (25), (26)

GENERAL INFORMATION								SPECIFIC WATER QUALITY PARAMETERS							POTENTIAL PROBLEMS						
Station No.	Stream	Class (a)	Category (b)	CO-WAMP Subbasin	County	Criter Stand. Group (c)	Average Flow cfs	pH S.U.	D.O. mg/l	TOT.Fe mg/l	TEMP. °C	TDS mg/l	ODOR S.U.	Total Colif. /100ml	ALL VALUES GIVEN AS mg/l					Overall Quality Rating	Will Stream Meet Water Quality Standards By 1983?
								mean/max.													
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
701	Monongahela River	WQL	I	19A	Allegheny	B+h k,q	10,727	OK/ 3.9	OK/.5	2.8/8	OK/40	OK	30/-	31,900/ 633,300	Al 4.2/22	SO_4 OK/540	Tot. Alk. OK/150	Mn OK/2.0		Fair	No. Number and complexity of the municipal and industrial discharges will require considerable time and money in order to meet water quality standards.
702	Monongahela River	WQL	I	19C	Washington	B+h, k,q	8,781	5.3/ 3.5	OK/ 1.2	1.9/ 15.6	OK	OK	27/-	11,200/ 139,200	Al OK/ 23.6	Zn .120/ .200	Ni OK/ .120	SO_4 OK/147	Tot.Alk OK/147	Fair to Poor	No. Lack of funds for mine drainage control projects.
703	Monongahela River	EL	II	19G	Greene	B+h, k,q	5,665	4.7/ 1.3	OK/ 1.8	2.8/ 20	OK	OK	32/ 54	1,500/ 27,000	Phenol .014/ .070	Al OK/5.8	Zn .150/ .150	SO_4 OK/650	Mn OK/2.8	Fair	Do.
704	Turtle Creek	WQL	I	19A	Westmoreland	$B-b_2$ $+b_3$	77 (d)													Severely Depressed	No. Some mine drainage affected areas will be restored. However, inadequate funds will prevent complete cleanup.
705	Abers Creek	WQL	I	19A	Allegheny	$B-b_2$ $+b_5$	43	OK/ 1.2	OK/ 1.1	2.9/ 50	OK	OK		120,000/ 918,000	Phenol OK/ .050	Ni OK/3.0	SO_4 OK/345	Mn OK/ 2760	Tot.Alk OK/154	Fair	
706	Youghiogheny River	WQL	I	19D	Westmoreland	B	4,556	OK/ 4	OK/ 1.0	2.9/ 8	OK	OK		22,600/ 428,100	Al 3.2/19	Zn OK/.080	SO_4 OK/345	Mn OK/1.7		Fair to Poor	No. Much of the mine drainage will be corrected, but lack of funds will prevent abatement of sewage pollution.

NOTES: (a) Classes: WQL = Water Quality Limited Stream
EL = Effluent Limited Stream
AMD = Acid Mine Drainage Affected Stream

(b) Categories: See definition in text, Section 2.1.6.4.
(c) 1974 Pa. Water Quality Criteria Groups and Levels as defined in Reference (28).
(d) Data Source: USGS Water Resources Bulletin No. 1.
(e) Discontinued.

TABLE 2.1.6.-15 (Continued)

GENERAL INFORMATION								SPECIFIC WATER QUALITY PARAMETERS							POTENTIAL PROBLEMS					Overall Quality Rating	Will Stream Meet Water Quality Standards By 1983?
Station No.	Stream	Class (a)	Category (b)	CO-WAMP Sub-basin	County	Criter Stand. Group (c)	Average Flow cfs	pH S.U.	D.O. mg/l	TOT.Fe mg/l	TEMP. °C	TDS mg/l	ODOR S.U.	Total Colif. /100ml	ALL VALUES GIVEN AS mg/l						
								mean/max.													
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
707	Youghiogheny River	EL	II	19D	Fayette	B	2439	OK/ 5.5	OK	OK/6	OK	OK		6000/ 70,000	Phenol OK/26	Al 2.7/27				Marginally acid.	Do.
708 (e)	Youghiogheny River	EL	II	19E	Fayette	A	1828	OK/ 5.1	OK	OK/ 8.0	OK	OK		4800/ 46,000	SO_4 OK/675					Good	Do.
710	Casselman River			19F	Somerset																No. Lack of funds for mine drainage control projects and sewage treatment plants.
712	Redstone Creek	WQL	II	19C	Fayette	$B+V_2$	223	OK/ 5.2	3.5/ 0	58/ 200	OK	826/ 2538		97,400/ 443,300	Phenol .300/ 1.400 NH_3-N OK/3.1	Al OK/3.9	Zn .056/ .060	Ni .270/ .360	SO_4 880/ 2150	Poor.	No. Lack of funds under 92-500 will prevent construction of necessary sewerage facilities.
713	South Fork Ten-mile Creek	WQL	II	19B	Greene	$B+V_2$	222	OK/ 8.8	OK/ 2.0	1.6/ 32	OK/31	OK		34,900/ 534,200	Phenol .022/ .040	Al 4.3/ 1.8	Zn .060/ .090	SO_4 OK/720	Tot.Alk OK/185	Good to Excellent.	Yes.
714	Dunkard Creek	WQL	II	19G	Greene	B	303	5.1/ 2.8	OK/ 1.4	31.4/ 200	OK	OK/ 1066		1800/ 28,500	Al 18.3 /.320	Zn .275/ .460	Ni .210/ .330	SO_4 656/ 2800	Mn 3.1/ 60	Fair to Good. Depressed downstream.	No. Lack of funds for mine acid control projects.
715	Sewickley Creek	WQL	I	19D	Westmoreland	B	289	OK/ 3.9	OK/ 1.0	12.3/ 34.	OK	OK/ 1096		139,800/ 591,100	Al OK/ 2.3	Zn .050/ .090	Ni .100/ .140	SO_4 300/ 695	Mn 1.1/ 3.6	Excellent head waters, poor below headwaters.	No. Much of the mine drainage will be corrected. Lack of funds will prevent complete cleanup.

NOTES: (a) Classes: WQL = Water Quality Limited Stream
EL = Effluent Limited Stream
AMD = Acid Mine Drainage Affected Stream

(b) Categories: See definition in text, Section 2.1.6.4.
(c) 1974 Pa. Water Quality Criteria Groups and Levels as defined in Reference (28).
(d) Data Source: USGS Water Resources Bulletin No. 1.
(e) Discontinued.

TABLE 2.1.6.-15 (Continued)

Station No.	Stream	Class (a)	Category (b)	CO-WAMP Sub-basin	County	Criter Stand. Group (c)	Average Flow cfs	pH S.U.	D.O. mg/l	TOT. Fe mg/l	TEMP. °C	TDS mg/l	ODOR S.U.	Total Colif. /100ml	POTENTIAL PROBLEMS — ALL VALUES GIVEN AS mg/l, mean/max.					Overall Quality Rating	Will Stream Meet Water Quality Standard By 1983?
GENERAL INFORMATION								SPECIFIC WATER QUALITY PARAMETERS													
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
716 (e)	South Fork Tenmile Creek	WQL	II	19B	Greene	B+V_2	203 (d)	OK	OK	OK	OK	OK			Al OK/1.9	SO_4 OK/410	Tot.Alk OK/174			Good	Yes.
717	Ten Mile Creek	WQL	II	19B	Washington	C+V_2		OK	OK	OK	OK	OK			SO_4 OK/182	Cl OK/235	Tot.Alk OK/156	NH_3-N OK/3.3		Good to Excellent.	
718	Pigeon Creek	WQL	I	19C	Washington	C+V_2	4 (d)	OK	OK	OK/2.4	OK	OK			Zn .200/.200	Ni .510/.510	SO_4 1151/4095	Tot. Alk. 171/336	Mn 5.5/5.5 NH_3-N OK/2.0	Marginal to Poor.	Yes.
719	Peters Creek	WQL	I	19C	Allegheny	B-b_2 +b_5	54 (d)	OK	OK	OK/2.7	OK	OK			Zn .140/.140	SO_4 477/858	Mn 1.1/1.1			Depressed.	Yes.
720 (e)	Turtle Creek	WQL	I	19A	Westmoreland	B-b_2 +b_5	–	4.5/4.5	OK	22.1/50	OK	OK			SO_4 294/408					Poor	No. Some mine drainage-affecte areas will be restored. Howev inadequate funds will prevent com plete cleanup.
721	Jacobs Creek	WQL	II	19D	Westmoreland	C+V_2	11	OK	OK	OK	OK	OK			Zn .100/.160	SO_4 OK/528	Mn OK/1.6			Severely Depressed Upstream. Fair downstream.	No. Mine drainag problem will not be corrected due to lack of funds
723	Big Sandy Creek	WQL	II	19G	Fayette	A	–	OK	OK	OK	OK/21	–	–	–	Zn.123/320					Excellent.	
724	Laurel Hill Creek			19E	Somerset																Yes.
725	Monongahela River	EL	II	19G	Greene	B+h,k,q	4494 (d)													Fair.	No. Lack of fund for mine drainag control projects

NOTES: (a) Classes: WQL = Water Quality Limited Stream
EL = Effluent Limited Stream
AMD = Acid Mine Drainage Affected Stream

(b) Categories: See definition in text, Section 2.1.6.4.
(c) 1974 Pa. Water Quality Criteria Groups and Levels as defined in Reference (28
(d) Data Source: USGS Water Resources Bulletin No. 1.
(e) Discontinue

ORSANCO recently assessed the water quality of the Ohio River main stem and its tributaries by comparing the data collected at its monitoring stations during the year July 1, 1975 - June 30, 1976 with ORSANCO's stream quality criteria (or with ORBC's criteria for the parameters lacking ORSANCO criteria). The parameters found to have exceeded those criteria at South Pittsburgh on the Monongahela River are listed below (37).

Parameter	Dissolved Oxygen	Total Suspended Solids	Fecal Coliforms for		Total Phosphorus	Cyanide	Iron
			Recreation	Water Supply			
% of Samples (or time) Exceeding ORSANCO/ORBC Criteria in 1975-76	3	7	100	63	20	62	29

Acid mine drainage, affecting many of the streams in the basin will not be brought under control within the foreseeable future due to insufficient funds available. The following waters are so polluted by abandoned mines that implementation of some effluent limitations to meet water quality standards has been postponed (35).

Stream Name	County
Thompson Run	Allegheny
Indian Creek from Champion to mouth	Fayette
Raspler Run	Fayette
Poplar Run	Fayette
Maple Creek	Washington
Bolden Run	Fayette
Bute Run	Fayette
Rankin Run	Fayette
Browns Run	Fayette
Little Whitely Creek	Greene
Whitely Creek from Mapleton to mouth	Greene
Cats Creek	Fayette
Jacobs Creek near Masontown	Fayette
Georges Creek from York Run to mouth	Fayette
York Run	Fayette
Dunkard Creek from state line to mouth	Greene
Cheat River	Fayette

5. Stream Quality Changes, 1973-1977

The Bureau of Water Quality Management, PA DER, bi-annually reports the recorded improvements and degradations in water quality. Table 2.1.6.-16 presents the improved lengths and Table 2.1.6.-17 the degraded length of the various streams in the Monongahela River Basin for the last five years (25).

In a recent study, ORSANCO evaluated the possible short-term trends in water quality parameters by comparing the 1964-75 data base with the July 1, 1975 - June 30, 1976 data at its monitoring stations (37). The results of the trend analysis at Charleroi on the Monongahela River are summarized below.

Parameter	Dissolved Oxygen	Water Temperature	pH	Turbidity	Spec. Cond.	Total Hardness
Trend	Increasing	Increasing	Increasing	No Statistically Significant Trend	Decreasing	
Level of Signific.	0.05	0.05	0.001		0.05	

TABLE 2.1.6.-16

STREAMS SHOWING WATER QUALITY IMPROVEMENTS (1973-1977)
MONONGAHELA RIVER BASIN
Source (25)

Year	Stream	County	Length Improved Miles	Reason for Improvement
1974	Jacobs Creek	Westmoreland	1	Improved industrial waste treatment
	Monongahela River	Greene Fayette Washington Westmoreland Allegheny	75	Mine drainage abatement
	South Branch Muddy Creek	Greene	0.5	Improved sewage treatment
	Sugar Run	Greene	0.5	Industrial waste treatment
1975	Youghiogheny River	Somerset	1	Sewage treatment
	Pollock Run	Westmoreland	5	Sewage treatment
	Monongahela River	Greene and Fayette	12	Mine drainage abatement
	Youghiogheny River	Westmoreland	1	Improved sewage treatment
	Unnamed Tributary of Turtle Creek	Allegheny	1	Elimination of siltation problem
	Unnamed Tributary to Peters Creek	Allegheny	2	Improved sewage treatment
1976	Monongahela River	Washington Fayette Westmoreland Allegheny	9	Industrial waste treatment
	Monongahela River	Allegheny	2	Improved sewage treatment
	Youghiogheny River	Westmoreland	1.5	Sewage treatment
	Long Run	Westmoreland and Allegheny	1	Sewage treatment
	Slate Run	Westmoreland	3	Sewage treatment
	Whitely Creek	Greene	7	Erosion control
	Muddy Creek	Greene	3.5	Sewage treatment
	Redstone Creek	Fayette	2.5	Removal of trash and debris
	Sewickley Creek	Westmoreland	1	Improved industrial waste treatment

TABLE 2.1.6.-17

STREAMS SHOWING WATER QUALITY DEGRADATION (1973-1977)
MONONGAHELA RIVER BASIN
Source (25)

Year	Stream	County	Length Degraded Miles	Reasons for Degradation
1975	Sewickley Creek	Westmoreland	1.5	Abandoned mine breakout
1976	Rasler Run	Fayette	4	Mine drainage
	Brush Run (Jacobs Creek)	Westmoreland	3	Surface mine drainage
	Little Pike Run	Washington	1	Mine drainage

B. Allegheny River Basin

1. General

The concentration of dissolved solids in the Allegheny River mainstem was reported in 1956 to vary in an opposing manner to what is generally expected. The relatively high concentration in the upstream region tended to decrease downstream toward Kittanning, Pennsylvania. This was due to the brine from the oil fields raising the sodium chloride content of the water in the Upper Allegheny River Basin and the resulting high concentrations diluted by water from other areas in the Middle and Lower Basins. Below Kittanning additional changes in the chemical character of the river water were brought about by acid mine drainage intorudced by the tributaries, especially the Kiskiminetas River: bicarbonate disappeared, sulfate content increased, and the pH dropped to acid condition (30).

In addition to acid mine drainage, which is still the most serious pollutant reaching the river, other forms of pollution from municipalities and industries resulted in further degradation of the Allegheny River quality in its Middle and Lower Basins. Shapiro et al. reported that the following pollutants were added in significant amounts in 1964-65: accidity, hardness, calcium, sulfates, iron, manganese, sodium, chlorides, phenol, total solids, and BOD (17).

The greatest portion of acidity, sulfates, iron, manganese, and hardness is contributed by the Kiskiminetas drainage area. To reduce the impact of these components on the Allegheny River, low-flow augmentation is provided by the Corps of Engineers from Allegheny Reservoir at Kinzua since 1967. Releases from the reservoir are coordinated not only with streamflow of the Allegheny River (to provide a contemplated minimum regulated flow of 1,000 cfs at Franklin and 2,000 cfs at Natrona) but also with its water quality, monitored at four stations in the basin (31). This low-flow augmentation for quality control is especially valuable to counteract slugs of acid mine waste from the Kiskiminetas drainage basin. These slugs, produced by heavy rainfall in the basin, are detained in the Conemaugh and Loyalhanna flood control reservoirs until increased flows from the Allegheny Reservoir can reach the confluence of the Kiskiminetas River to provide dilution water. The augmented flow also helps to mitigate the taste and odor problems primarily caused by the organic loading from Oil Creek, French Creek, and the Clarion River (32).

Another reservoir in the Allegheny River Basin operated for low-flow augmentation is the East Branch Clarion Reservoir. Its main purpose is to prevent septic conditions in the main stem of Clarion River between Johnsonburg and Ridgway during periods of low flow. Its beneficial effect, however, extends further downstream by providing dilution and neutralization of the acid Clarion and Kiskiminetas Rivers (33).

With increasing control of waste effluents from manufacturing plants, municipalities, and active mines, acid mine drainage from abondoned mines will continue to be a problem. Also, the large concentrations of fecal bacteria reaching Pittsburgh indicate a future problem, even after the acidity and other problems are alleviated (34).

2. Surface Water Quality

Figure 2.1.6.-24 shows the yearly averages and ranges of water temperature, conductivity, dissolved oxygen, and pH for the Allegheny River at Oakmont as calculated from ORSANCO'S Robot Minitor data. The figure indicates generally good dissolved oxygen levels, improving pH and slightly rising temperatures during 1970 through 1977. Figure 2.1.6.-25 shows the range and mean of monthly averages for the same parameters at Oakmont. The summer is the critical period for all four parameters: temperature and conductivity reach maxima,

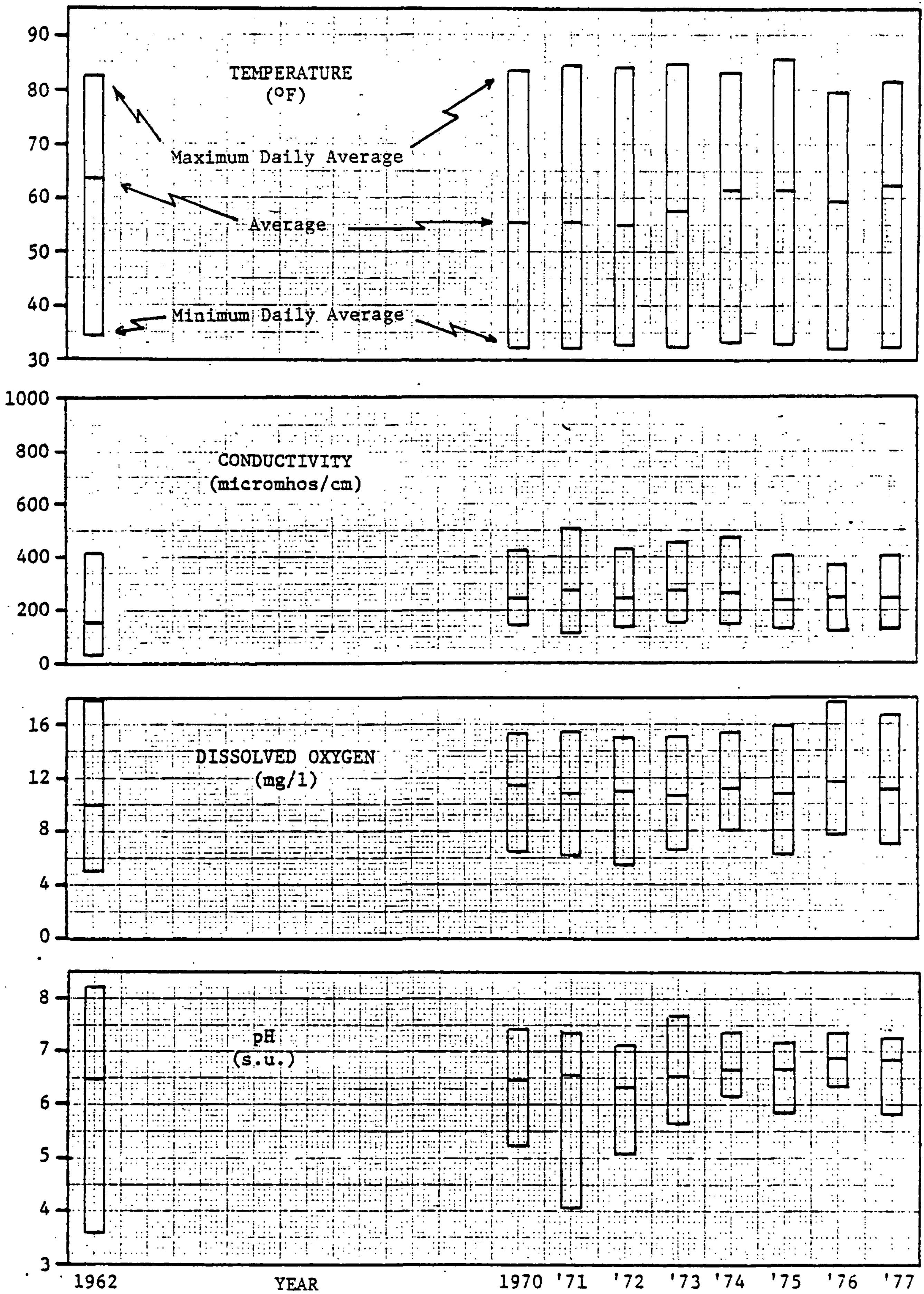


FIGURE 2.1.6.-24 ANNUAL WATER QUALITY -- ALLEGHENY RIVER AT OAKMONT (6)

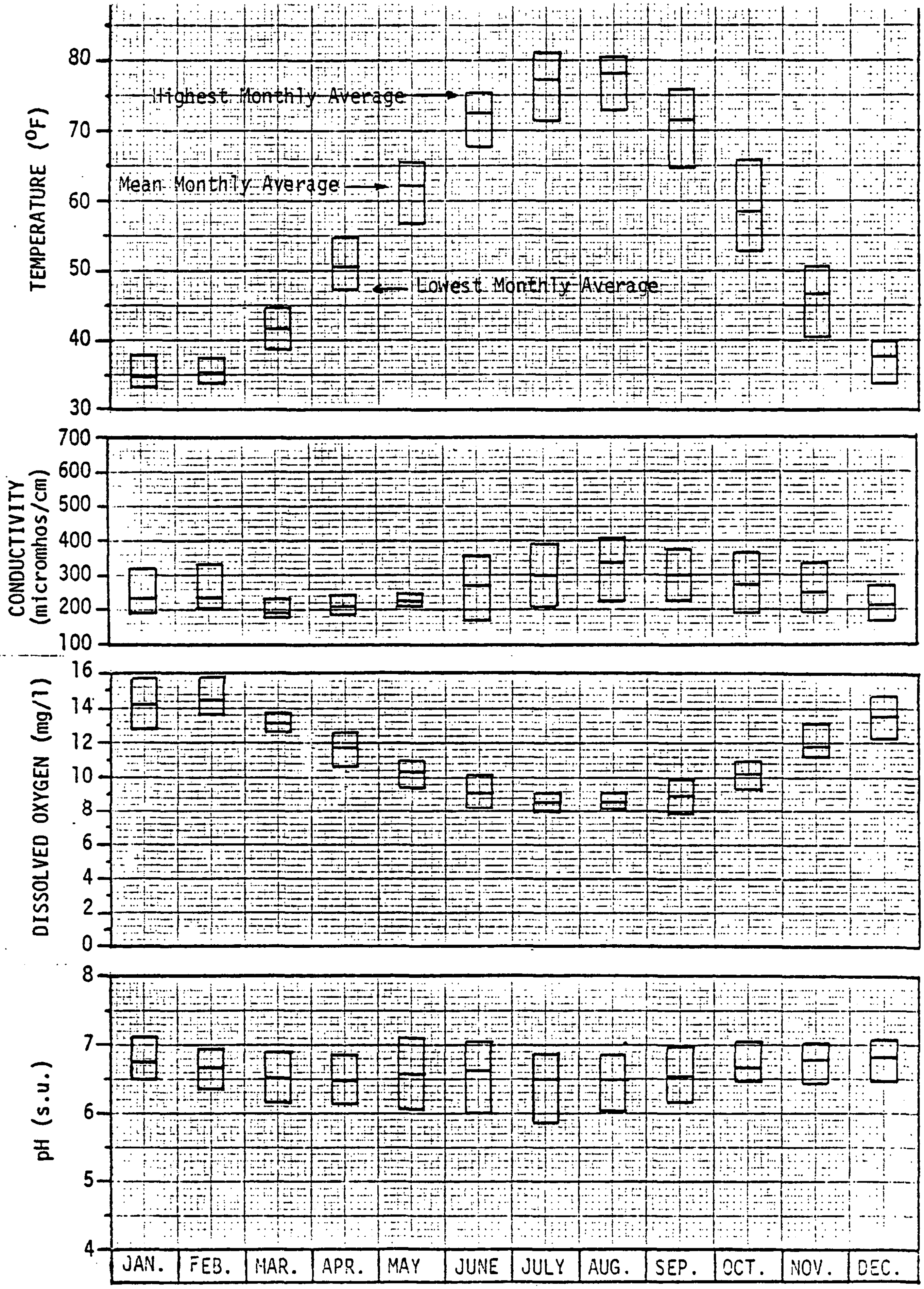


FIGURE 2.1.6.-25 SEASONAL VARIATION OF WATER QUALITY: MONTHLY AVERAGES ALLEGHENY RIVER AT OAKMONT, 1970-77 After Source (6)

dissolved oxygen and pH reach minima during the warm weather period. Both figures were derived from ORSANCO'S Robot Monitor data (6).

Tables 2.1.6.-18 and 2.1.6.-19 give twelve-year means of selected parameters at a number of Water Quality Network Stations in the Upper, Middle, and Lower Allegheny River Basins (1), (2). Mean, maximum, and minimum values of most parameters sampled at selected stations in the Allegheny River Basin are presented in Table 2.1.6.-20 for the 1972-73 period and in Table 2.1.6.-21 and 2.1.6.-22 for the 1975-77 period, as derived from the STORET System.

The longitudinal variation of a few major water quality parameters in the Little Conemaugh/Conemaugh Rivers and Stony Creek is illustrated in Figures 2.1.6.-26 and 2.1.6.-27, respectively. Figure 2.1.6.-28 shows the time variation of major parameters at Station 811 in the Conemaugh River between January 1970 and December 1974 (3).

3. Water Quality Problems

The major water quality problems in the Allegheny River Basin are presented in Table 2.1.6.-23, along with the DER-assigned classes and categories as extracted from References (1), (2), (25), and (26).

Acid mine drainage is the major cause of water quality problems in the Basin, especially in the Clarion, Conemaugh, and Kiskiminetas watersheds where many streams suffer from low pH and high concentrations of free sulfuric acid, sulfate, and metals such as iron, aluminum, manganese, nickel, and zinc. The streams degraded by acid mine drainage are classed AMD in the Table.

Inadequately treated or raw (the latter mostly originating from malfunctioning on-lot waste disposal systems) municipal and industrial waste discharges cause additional problems, particularly in the Upper and Middle Basins. Redbank Creek near Reynoldsville, Brookville and New Bethlehem,

TABLE 2.1.6.-18

MEAN VALUES OF SELECTED PARAMETERS AT SAMPLING STATIONS IN THE UPPER ALLEGHENY RIVER BASIN
(Data Collected from May 1962 to December 1974)

Source (1)

	Stream						
	Allegheny River		French Creek	Tionesta Creek		French Creek	Tionesta Creek
	Sampling Station (PA-DER WQN No.)						
Parameter	804	805	826	829	830	845	853
pH (S.U.)	6.9	7.0	6.8	6.6	6.7	7.7	6.7
Dissolved Oxygen (mg/l)	10.0	10.2	9.8	10.7	10.7	10.1	8.5
Total Iron (ug/l)	795	457	1,000	438	490	883	379
Total Dissolved Solids (mg/l)	132	92	120	58	56	154	76
Temperature (^{o}C)	ND	10.7	11.5	11.5	11.7	25.9	23.2
Turbidity (JTU)	12.5	11.0	12.9	6.6	6.8	7.6	3.4
Ammonia (mg/l N)	0.15	0.13	0.33	0.14	0.10	0.14	0.13
Total Phosphorus (mg/l P)	0.07	0.06	0.1	0.04	0.04	0.07	0.02
Alkalinity (as $CaCO_3$) (mg/l)	53.7	50.6	74.5	19.8	22.3	61.5	18.1
Biochemical Oxygen Demand (mg/l)	2.2	1.7	2.1	1.7	1.6	ND	ND
Total Coliform (#/100 ml)	59,000	12,000	28,000	1,200	34,800	ND	ND

TABLE 2.1.6.-19

MEAN VALUES OF SELECTED PARAMETERS AT SAMPLING STATIONS IN THE MIDDLE AND LOWER ALLEGHENY RIVER BASINS
(Data collected from June 1962 to December 1974)

Source (2)

	Stream								
	Allegheny River			Clarion River		West Branch Clarion River	East Branch Clarion River	Clarion River	
	Sampling Station (PA-DER WQN No.)								
Parameter	801	802	803	821	823	824	825	833	843
pH (S.U.)	6.7	7.1	7.3	5.2	6.2	6.6	5.2	5.3	5.6
Dissolved Oxygen (mg/l)	10.2	10.8	10.5	9.0	8.9	10.7	10.9	8.2	8.1
Total Iron (ug/l)	4,975	646	1,008	735	452	375	329	395	741
Total Dissolved Solids (mg/l)	24	11	61	113	91	74	61	63	228
Temperature (^{o}C)	10.9	12.8	11.5	12.0	13.5	10.7	11.4	12.4	24.8
Turbidity (JTU)	13.6	11.7	11.8	8.3	18.9	5.7	5.0	7.5	4.5
Ammonia (mg/l N)	0.27	0.23	0.14	0.18	0.15	0.08	0.9	0.25	0.15
Total Phosphorus (mg/l P)	0.04	0.05	0.12	0.05	0.05	0.02	0.02	0.06	0.02
Alkalinity (as $CaCO_3$) (mg/l)	19.8	37.9	41.3	9.8	19.0	25.8	6.1	22.6	6.5
Biochemical Oxygen Demand (mg/l)	2.0	2.0	1.9	1.4	13.1	1.7	1.4	2.6	ND
Total Coliform (#/100 ml)	12,300	7,800	32,600	300	133,600	61,500	8	29,800	ND

TABLE 2.1.6.-20

ALLEGHENY RIVER WATER QUALITY (from EPA STORET System)

Source (34)

Parameter	Pittsburgh, Pennsylvania 4/4/72 to 12/17/73 Number of Samples	Mean Value	Maximum Value	Minimum Value	Kittanning, Pennsylvania 9/14/72 to 9/24/74 Number of Samples	Mean Value	Maximum Value	Minimum Value
Water Temperature, °C	15	14.6	25.0	0.5	7	16.4	28	4
Flow, cfs	13	14,563.1	52,400	4,500	2	14,500	15,000	14,000
Turbidity, JTU	12	8.9	35.0	1.0	8	8.7	33	0.5
Threshold Odor Number at 60°C	3	0	0	0	--	------	---	---
Conductivity at 25°C, micromhos/cm	15	328.5	440.0	250.0	7	244.4	600	150
Dissolved Oxygen, mg/l	15	9.7	11.6	7.0	7	9.9	12.4	7.9
Biochemical Oxygen Demand, 5 day, mg/l	15	1.8	2.8	1.0	1	1.6	1.6	1.6
pH, units	15	6.7	7.4	6.3	8	7.0	7.4	6.5
Total Alkalinity, mg/l as $CaCO_3$	12	17.2	25	13	8	51.6	212	15
Total Acidity, mg/l $CaCO_3$	12	3.4	9	0	--	--------	-----	-----
Total Filtered Residue, mg/l	12	181.2	236	147	1	162	162	162
Ammonia Nitrogen, mg/l	14	0.3	0.8	0.1	8	0.25	1.4	0
Nitrate Nitrogen, mg/l	12	0.5	0.8	0.3	8	0.46	0.9	0.2
Total Phosphorus, mg/l	12	0.07	0.12	0.03	8	0.05	0.12	0
Orthophosphate, mg/l	12	0.04	0.06	0.02	--	------	------	----
Oil and Grease, mg/l	5	22.4	37.6	2.6	--	------	------	----
Total Organic Carbon, mg/l	15	2.9	8.0	1.0	--	------	------	----
Total Hardness, Mg/l as $CaCO_3$	12	103.8	148	60	8	77	93	58
Chloride, mg/l	12	15.9	43	7	8	13	18	4
Sulfate, mg/l	12	86.3	145	40	8	46.6	82	21
Dissolved Fluoride, mg/l	12	0.2	0.4	0.1	--	---	---	--
Cyanide, mg/l	15	0.003	0.01	0.0	--	---	---	--
Total Arsenic, mg/l	8	.002	.005	0	--	---	---	--
Total Cadmium, mg/l	7	.001	.004	0	2	0.004	0.005	0.003
Total Chromium, mg/l	7	.001	.003	0	2	0.05	0.09	0.01
Total Copper, mg/l	8	0.006	.01	0	2	0.055	0.08	0.03
Total Iron, mg/l	11	0.9	3.6*	0.13	8	0.822	2.70*	0.160
Total Manganese, mg/l	10	0.7	1.5*	0.5	9	0.331	0.61	0.033
Total Lead, mg/l	7	0.012	0.055	0	2	0.05	0.05	0.05
Total Zinc, mg/l	8	0.097	0.176	0.044	2	0.035	0.04	0.03
Mercury, mg/l	----	-----	-----	---	--	-----	-----	----
Total Coliforms, No/100 ml	12	6,783	63,000	500	--	-----	-----	----
Fecal Coliforms, No/100 ml	12	908*	4,500	16	--	-----	-----	----
Phenols, mg/l	15	0.027	0.035	0	--	-----	-----	----

* Exceeds the state's specific water quality criteria

TABLE 2.1.6.-20 (Continued)

Parameter	New Kensington, Pennsylvania 7-18-72 to 10-4-74			
	Number of Samples	Mean Value	Maximum Value	Minimum Value
Water Temperature, ^{o}C	9	13.3	25	0.5
Flow, cfs	8	22,240	51,500	5740
Turbidity, JTU	3	1.3	3.0	0.5
Conductivity at 25^{o}C, micromhos/cm	8	230.7	348	130
Dissolved Oxygen, mg/l	8	11.3	17.5	7.8
Biochemical Oxygen Demand, 5 day, mg/l	1	1.0	1.0	1.0
pH, units	9	6.5	6.7	6.2
Total Alkalinity, mg/l as $CaCO_3$	8	12.9	30	6
Total Acidity, mg/l $CaCO_3$	2	9.5	17	2
Total Filtered Residue, mg/l	1	298	298	298
Ammonia Nitrogen, mg/l	2	0.28	0.3	0.25
Nitrate Nitrogen, mg/l	3	1.3	2.8	0.4
Total Phosphorus, mg/l	2	0.05	0.07	0.02
Total Organic Carbon, mg/l	6	4.0	6.5	3.0
Total Hardness, mg/l as $CaCO_3$	3	100	118	84
Chloride, mg/l	4	13	14	12
Sulfate, mg/l	4	94.8	125	62
Total Fluoride, mg/l	3	0.3	0.4	0.2
Dissolved Arsenic, mg/l	1	0.01	0.01	0.01
Dissolved Cadmium, mg/l	1	0.004	0.004	0.004
Dissolved Chromium, mg/l	1	0.006	0.006	0.006
Dissolved Copper, mg/l	1	0.004	0.004	0.004
Total Iron, mg/l	2	0.2	0.33	0.07
Total Manganese, mg/l	2	0.575	0.930	0.220
Dissolved Lead, mg/l	1	0.001	0.001	0.001
Dissolved Zinc, mg/l	1	0.062	0.062	0.062

TABLE 2.1.6.-21 ALLEGHENY RIVER WATER QUALITY, 1975-77 (From EPA's STORET System)

Parameter	WQN Station No. 801 Allegheny River at New Kensington				WQN Station No. 803 Allegheny River at PR 368				WQN Station No. 804 Allegheny River at Franklin			
	No. of Samples	Mean Value	Maximum Value	Minimum Value	No. of Samples	Mean Value	Maximum Value	Minimum Value	No. of Samples	Mean Value	Maximum Value	Minimum Value
Water Temperature, °C	9	8.9	24.0	0	23	8.7	21.5	0	25	11.6	25.0	0
Flow, cfs	4	30,125	58,600	18,500	23	14,756	56,000	3,000	26	11,712	48,200	2,880
Turbidity, JTU	2	5.3	5.6	5.0	13	6.2	18.0	1.6	34	8.0	40.0	2.0
Conductivity at 25°C, micromhos/cm	9	239	320	180	25	1,236	26,600	120	34	158	290	100
Dissolved Oxygen, mg/l	8	11.8	14.0	8.0	23	11.0	13.6	8.0	27	10.7	15.0	7.7
pH, Standard Units	9	7.1	8.1	6.7	23	7.4	8.1	6.7	29	7.4	8.4	6.7
Total Alkalinity, mg/l as $CaCO_3$	9	21	34	16	25	46	256	14	34	40	147	20
Mineral Acidity, mg/l	8	0	0	0	25	0	0	0	--	--	--	--
Acidity from CO_2, mg/l	9	0	0	0	25	0	0	0	2	0	0	0
Total Residue, mg/l	--	--	--	--	--	--	--	--	13	112	152	68
Dissolved/105° Residue, mg/l	8	149	205	105	24	118	190	60	33	110	180	66
Total Nonfilterable Residue, mg/l	--	--	--	--	--	--	--	--	22	15	56	2
Settleable Residue, ml/l	--	--	--	--	--	--	--	--	15	0.283	0.800	0.004
Oil and Grease, mg/l	--	--	--	--	--	--	--	--	--	--	--	--
Total NH_3-N, mg/l	9	0.31	0.89	0.10	25	0.19	1.40	0.03	34	0.17	0.91	0
Total NO_2-N, mg/l	8	0.034	0.120	0.004	23	0.009	0.020	0.002	34	0.014	0.048	0
Total NO_3-N, mg/l	6	0.60	1.06	0.04	21	0.52	1.39	0.17	34	0.69	2.16	0
Total Phosphorus, mg/l P	9	0.14	0.20	0.02	24	0.13	0.53	0.02	34	0.07	0.20	0.01
Total Cyanide, mg/l	--	--	--	--	--	--	--	--	--	--	--	--
Total Hardness, mg/l as $CaCO_3$	9	89	122	60	25	69	140	22	34	60	120	36
Dissolved Calcium, mg/l	9	22.8	30.3	15.0	24	18.2	27.9	6.7	28	17.0	32.9	9.6
Dissolved Magnesium, mg/l	9	8.6	15.0	5.3	24	5.5	17.3	0	28	4.7	10.2	2.2
Chloride, mg/l	9	16.4	20.0	12.0	23	16.1	35.0	10.0	34	14.7	21.0	7.0
Total Sulfate, mg/l	9	67	95	35	25	35.9	400.0	10.0	34	16	32	4
Total Fluoride, mg/l	--	--	--	--	--	--	--	--	--	--	--	--
Total Arsenic, mg/l	1	0.020	0.020	0.020	2	0.060	0.100	0.020	--	--	--	--
Total Cadmium, mg/l	2	0.020	0.020	0.020	2	0.015	0.020	0.010	2	0.003	0.003	0.003
Total Chromium, mg/l	2	0.050	0.050	0.050	2	0.050	0.050	0.050	3	0.013	0.020	0.010
Total Copper, mg/l	2	0.050	0.050	0.050	2	0.050	0.050	0.050	3	0.013	0.020	0.010
Total Iron, mg/l	9	1.093	1.900	0.550	25	0.426	1.250	0.050	35	0.808	2,990	0.040
Total Lead, mg/l	2	0.100	0.100	0.100	2	0.055	0.100	0.010	3	0.037	0.050	0.010
Manganese, mg/l	2	0.655	0.810	0.500	25	0.158	0.660	0.020	2	0.085	0.100	0.070
Total Nickel, mg/l	2	0.050	0.050	0.050	2	0.050	0.050	0.050	2	0.018	0.020	0.015
Total Zinc, mg/l	2	0.075	0.100	0.050	2	0.050	0.070	0.030	3	0.033	0.070	0.010
Total Aluminum, mg/l	2	0.975	1.450	0.500	25	0.227	0.800	0.010	3	0.447	0.640	0.200
Total Coliforms, no./100 ml	--	--	--	--	--	--	--	--	--	--	--	--
Fecal Coliforms, no./100 ml	--	--	--	--	21	360	5,900	20	17	337	4,300	10
Total Phenols, mg/l	--	--	--	--	--	--	--	--	--	--	--	--
Total Mercury, mg/l	1	0.0005	0.0005	0.0005	2	0.0008	1.000	0.0005	2	0.002	0.002	0.002

TABLE 2.1.6-22 KISKIMINETAS, CONEMAUGH, AND CLARION RIVER WATER QUALITY, 1975-77 (FROM EPA's STORET SYSTEM)

Parameter	WQN Station No. 809 Kiskiminetas River at Vandergrift				WQN Station No. 810 Conemaugh River at Tunnelton				WQN Station No. 821 Clarion River at Piney			
	No. of Samples	Mean Value	Maximum Value	Minimum Value	No. of Samples	Mean Value	Maximum Value	Minimum Value	No. of Samples	Mean Value	Maximum Value	Minimum Value
Water Temperature, °C	15	8.2	22.0	0	8	10.5	31.0	0.3	9	9.1	21.0	0
Flow, cfs	5	2,204	2,980	1,200	5	2,348	4,320	1,070	10	4,043	4,800	2,460
Turbidity, JTU	9	17.1	36.0	3.2	4	16.3	28.0	4.0	10	3.0	5.0	1.0
Conductivity at 25°C, micromhos/cm	16	493	1,000	275	9	471	720	200	10	171	240	110
Dissolved Oxygen, mg/l	14	10.5	14.0	4.0	7	12.2	19.0	9.0	10	10.1	14.0	7.0
pH, Standard Units	14	4.9	6.8	3.7	8	4.8	5.6	3.7	10	5.9	6.9	5.1
Total Alkalinity, mg/l as $CaCO_3$	16	1.25	10	0	9	4.1	25.0	0	10	6.3	18.0	2.0
Mineral Acidity, mg/l	13	5.8	30	0	8	6.3	50.0	0	-	-	-	-
Acidity from CO_2, mg/l	15	58	180	12	9	28.6	60.0	0	3	5	10	2
Total Residue, mg/l	-	-	-	-	-	-	-	-	4	113	144	56
Dissolved/105° Residue, mg/l	15	282	667	144	8	297	500	140	10	128	176	54
Total Nonfilterable Residue, mg/l	-	-	-	-	-	-	-	-	7	3.7	6.0	2.0
Settleable Residue, ml/l	-	-	-	-	-	-	-	-	4	0.11	0.20	0.05
Oil and Grease, mg/l	-	-	-	-	-	-	-	-	-	-	-	-
Total NH_3-N, mg/l	16	0.80	1.85	0.20	9	0.76	1.64	0.20	10	0.18	0.41	0.06
Total NO_2-N, mg/l	15	0.012	0.038	0.002	8	0.019	0.038	0.002	10	0.016	0.026	0.007
Total NO_3-N, mg/l	13	0.89	1.50	0.04	6	1.06	1.64	0.64	10	0.61	1.40	0.23
Total Phosphorus, mg/l P	16	0.13	0.37	0.02	8	0.20	0.46	0.03	10	0.03	0.07	0.01
Total Cyanide, mg/l	9	0.03	0.05	0.01	-	-	-	-	-	-	-	-
Total Hardness, mg/l as $CaCO_3$	16	171	475	80	9	153	225	65	10	63	78	44
Dissolved Calcium, mg/l	16	40.0	83.9	21.0	9	39	65	18	9	15.4	32.1	9.8
Dissolved Magnesium, mg/l	16	17.2	64.6	7.1	9	14	21	4.6	9	5.7	8.8	2.0
Chloride, mg/l	16	15.3	21.0	11.0	9	14	28	7.0	10	9.1	14.0	6.0
Total Sulfate, mg/l	16	175	300	65	9	167	270	60	10	49	76	30
Total Fluoride, mg/l	16	0.18	0.28	0.10	8	0.16	0.22	0.10	-	-	-	-
Total Arsenic, mg/l	-	-	-	-	-	-	-	-	-	-	-	-
Total Cadmium, mg/l	-	-	-	-	1	0.003	0.003	0.003	1	0.001	0.001	0.001
Total Chromium, mg/l	-	-	-	-	1	0.040	0.040	0.040	1	0.010	1.010	0.010
Total Copper, mg/l	-	-	-	-	1	0.040	0.040	0.040	1	0.020	0.020	0.020
Total Iron, mg/l	15	6.026	16.000	0.400	9	3.475	8.000	0.450	10	0.645	1.210	0.180
Total Lead, mg/l	-	-	-	-	1	0.050	0.050	0.050	1	0.010	0.010	0.010
Manganese, mg/l	15	1.212	2.800	0.620	9	1.141	1.770	0.600	1	0.960	0.960	0.960
Total Nickel, mg/l	-	-	-	-	1	0.100	0.100	0.100	1	0.050	0.050	0.050
Total Zinc, mg/l	-	-	-	-	1	0.140	0.140	0.140	1	0.120	0.120	0.120
Total Aluminum, mg/l	15	2.917	10.000	0.800	9	2.539	4.700	0.100	5	0.610	1.200	0.250
Total Coliforms, no./100 ml	-	-	-	-	-	-	-	-	-	-	-	-
Fecal Coliforms, no./100 ml	15	24	60	20	-	-	-	-	5	10	10	10
Total Phenols, mg/l	10	0.011	0.041	0.003	-	-	-	-	-	-	-	-
Total Mercury, mg/l	-	-	-	-	-	-	-	-	-	-	-	-

FIGURE 2.1.6.-26 SPATIAL WATER QUALITY PROFILE -- LITTLE CONEMAUGH/CONEMAUGH RIVER, OCTOBER 1974 Source (3)

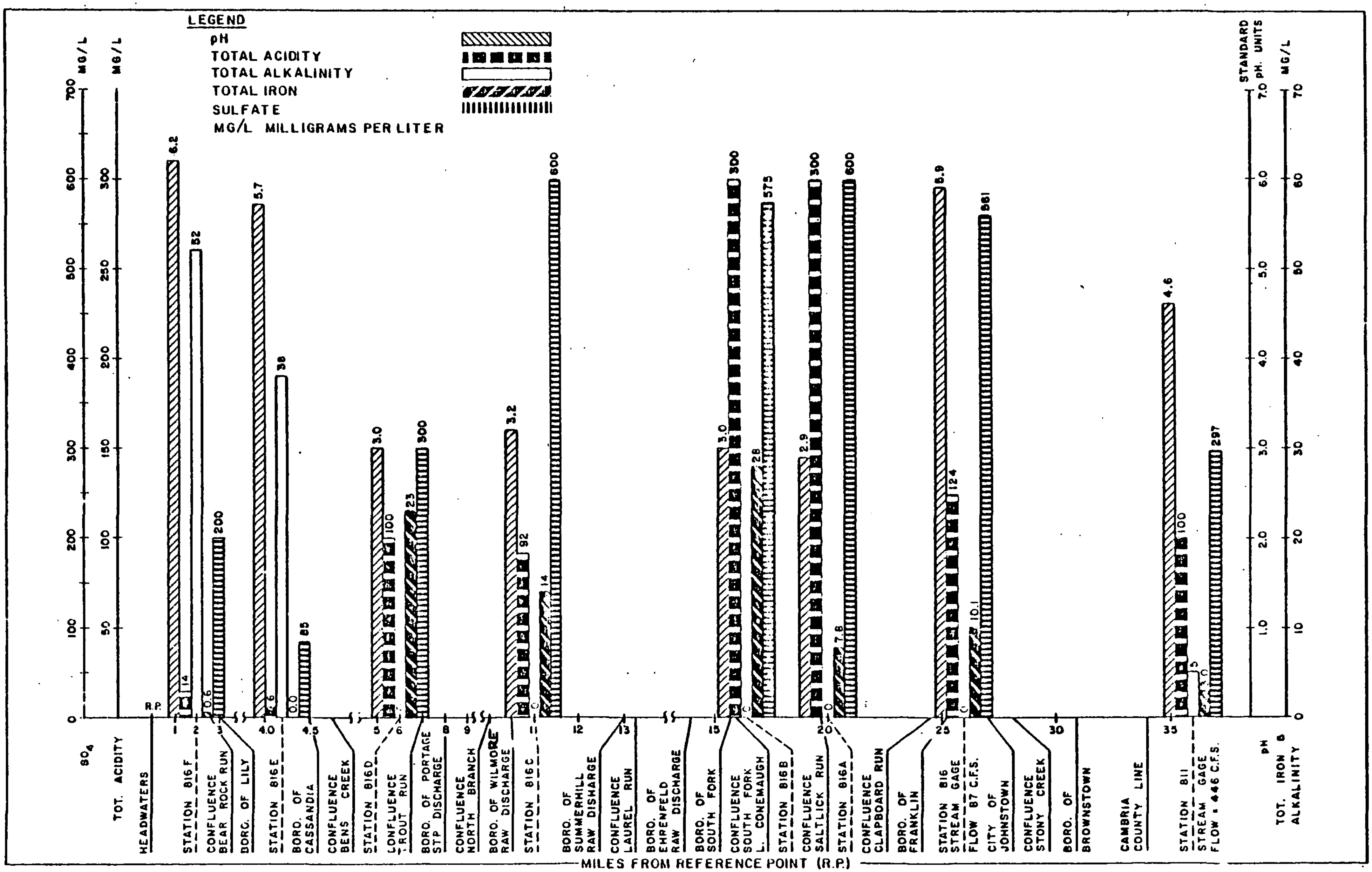


FIGURE 2.1.6.-27 SPATIAL WATER QUALITY PROFILE -- STONY CREEK, MARCH 1973

Source (3)

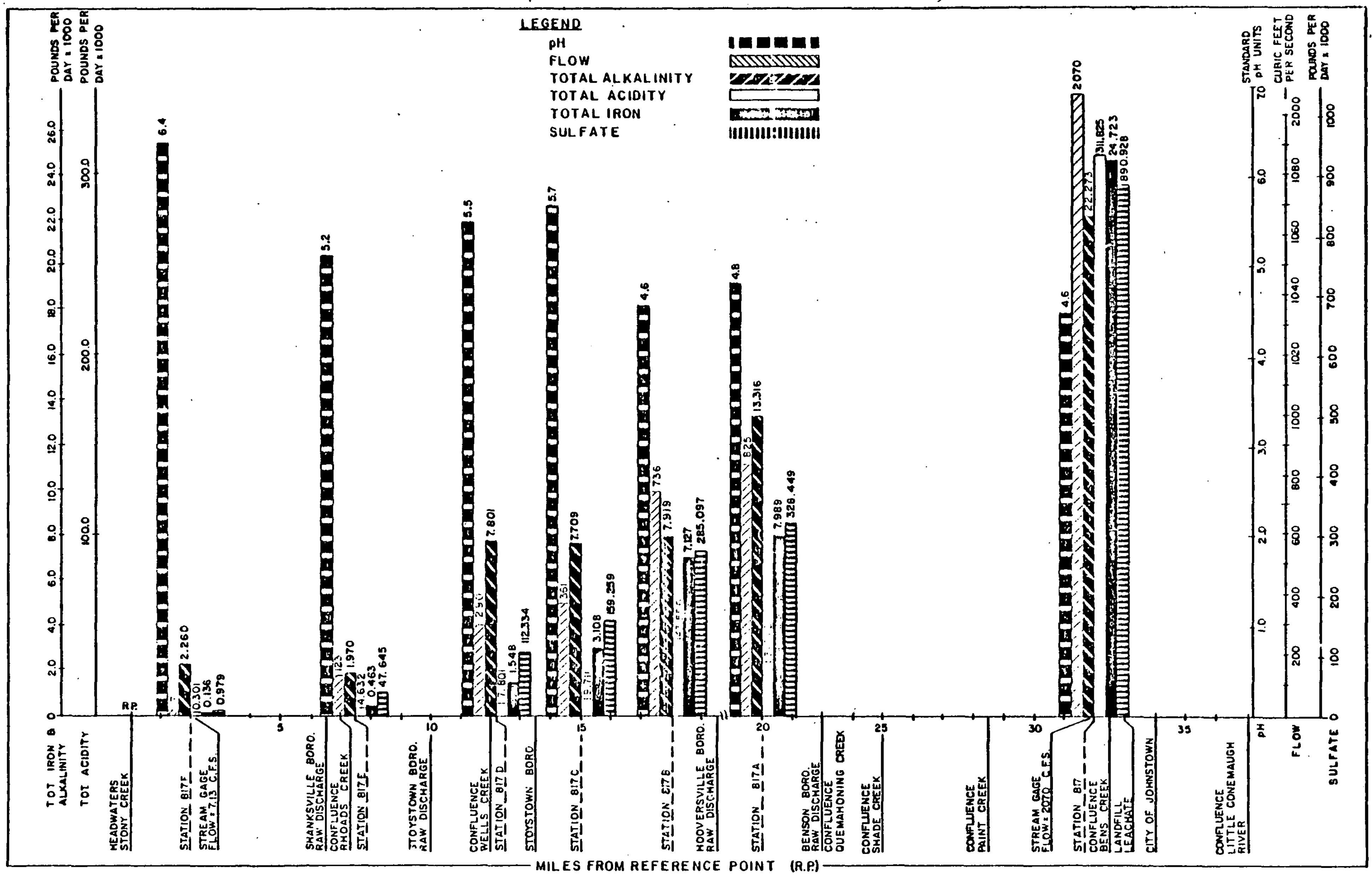


FIGURE 2.1.6.-28 TEMPORAL WATER QUALITY PROFILE -- CONEMAUGH RIVER, STATION 811, 1970-1974 Source (3)

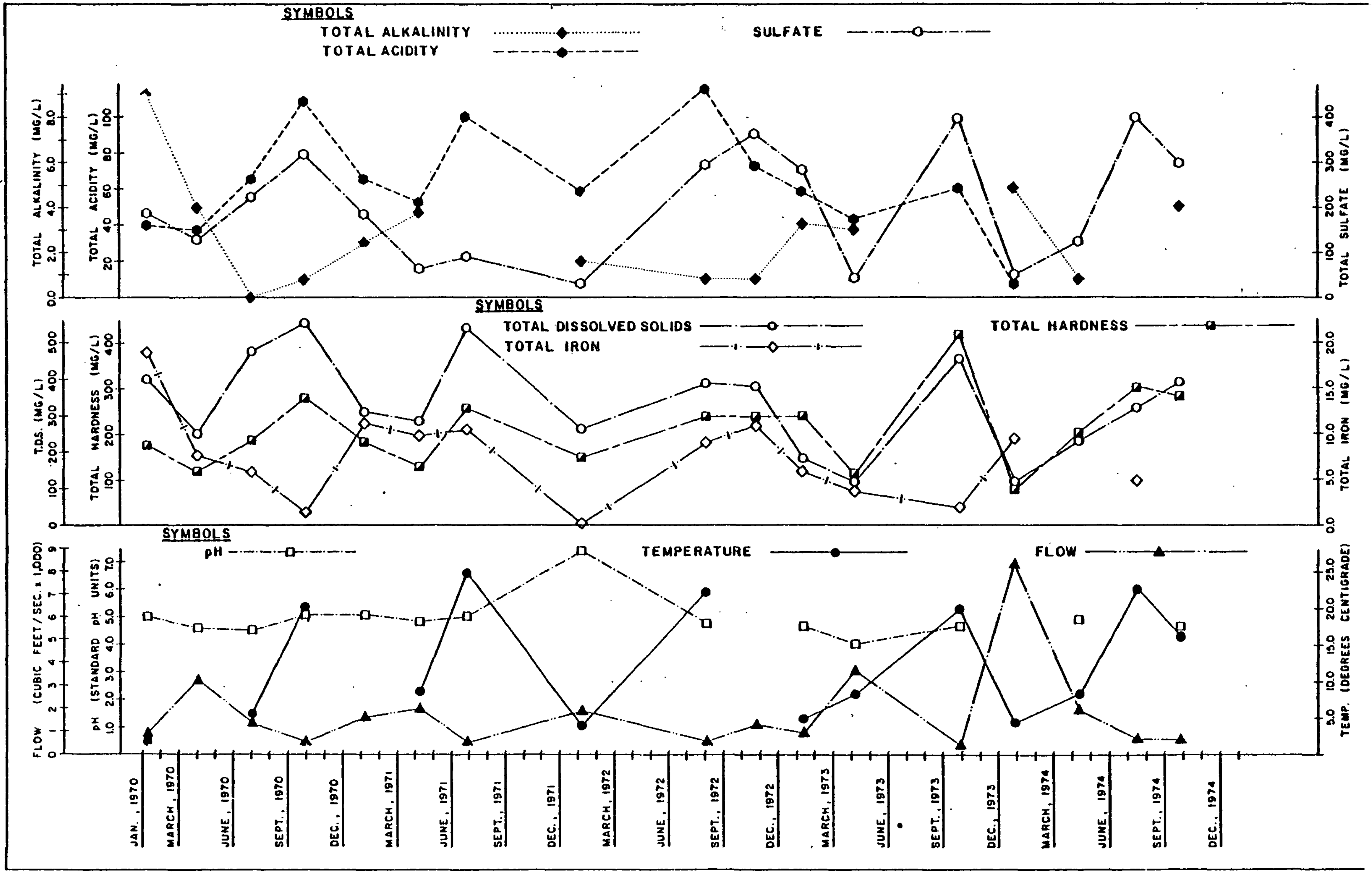


TABLE 2.1.6.-23 CLASSIFICATION AND QUALITY PROBLEMS OF MAJOR STREAMS - ALLEGHENY RIVER BASIN SOURCES (2), (25), (26)

Stream	Stream Segment	CO-WAMP Sub-Basin	Class (a)	Category (b)	Problems	Causes of Problems (Parameter Group Violation) (c)	Miles of Stream Degraded By Problems
Sugar Creek		16D				Sewage, filter backwash.	
Oil Creek	Lower Reach	16E			Oil pollution.	Oil drilling and related operations.	3.5
Johnson Run	Entire Watershed	17A	AMD	II			
Daguscahonda Run	Entire Watershed	17A	AMD	II			
Elk Creek	Vicinity of St. Marys.	17A	AMD	II	Solids and iron precipitates are primary problems.	Water quality affected by heavy industrial loads, landfill discharge and acid mine drainage.	8
Brandy Camp Creek	Brandy Camp to Mouth	17A	AMD	II			
Meade Run	Shawmut to Mouth	17A	AMD	II			
Toby Creek	Main Stem Only (Elk & Jefferson Co)	17A	AMD	II			
W.Br. Clarion R.	Halsey to Wilcox	17A			Brines.	Abandoned gas wells.	
Mill Creek	Main Stem Only	17B	AMD	III		Water quality affected by acid mine drainage (1, 4, 5).	52.5
Toby Creek	Entire Watershed (Clarion County)	17A, B	AMD	III			
Piney Creek	Entire Watershed	17B	AMD	III			
Deer Creek	Entire Watershed	17B	AMD	III			
Licking Creek	Entire Watershed	17B	AMD	III			
Canoe Creek	Entire Watershed	17B	AMD	III			
Clarion River	Mill Creek to Mouth	17B	AMD	III	Depressed dissolved oxygen levels, color.	Discharges of raw sewage and inadequately treated paper mill wastes (2, 3, 4).	4
Sandy Lake		16G	WQL	II	Phosphorus.		
Sandy Creek	Above Lake Wilhelm Dam	16G	WQL	II	Phosphorus, turbidity.	Water treatment filter backwash.	
East Sandy Creek	Headwater Area	16G	AMD			Acid mine drainage (1, 4, 5).	9
Scrubgrass Creek	Entire Watershed	16G	AMD		Acid mine drainage.	Abandoned mines (1, 4, 5).	6
Sandy Lick Creek		17C			Dissolved oxygen, acid mine drainage.	Raw sewage discharges at Falls Creek Borough & Reynoldsville, abandoned mines (1, 2, 3, 4, 5).	3
Bear Creek	South Branch & Main Stem below Confluence to source. North Branch	17C	WQL	III	MBAS; Oil; BOD; NH_3; toxic organics; Iron, Sulfates, low pH.	Petrochemical wastes from Petrolia area; raw & inadequately treated sewage discharge from Bruin-Petrolia-Karns City area; minor affect from acid mine drainage. North branch affected by drainage from extensive strip mining and oil and gas wells. (1,2,3,4,5)	20

TABLE 2.1.6.-23 (Continued)

Stream	Stream Segment	CO-WAMP Sub-Basin	Class (a)	Category (b)	Problems	Causes of Problems (Parameter Group Violation) (c)	Miles of Stream Degraded By Problems
Redbank Creek		17C				Water quality degradation due to discharges of inadequately treated & raw sewage (2, 4).	3
Soldier Run	Entire Watershed	17C	AMD	III			
Goder Run	Main Stem Only	17C	AMD	III			
Beaver Run	Main Stem Only	17C	AMD	III			
Pine Creek	Entire Watershed	17C	AMD	III			
Middle Run	Entire Watershed	17C	AMD	III			
Long Run	Entire Watershed	17C	AMD	III			
Leatherwood Creek	Jack Run to Mouth	17C	AMD	III			
Rock Run	Entire Watershed	17C	AMD	III			
Wildcat Run	Entire Watershed	17C	AMD	III			
Welch Run	Entire Watershed	17C	AMD	III			
Runaway Run	Entire Watershed	17C	AMD	III			
Town Run		17C	AMD	III			
Leisure Run	Entire Watershed	17C	AMD	III		Acid mine drainage pollution (1, 4, 5).	36
Fiddlers Run		17C	AMD	III			
Catfish Run		17C	AMD	III			
Redbank Creek	Mouth to ?	17C	AMD	III			
Stump Creek	Main Stem Only	17D	AMD	III			
Little Elk Run	Entire Watershed	17D	AMD	III			
Hamilton Run	Entire Watershed	17D	AMD	III			
Glade Run	Entire Watershed	17D	AMD	III		Acid mine drainage.	
Pine Run	Entire Watershed	17D	AMD	III		Acid mine drainage.	
Mahoning Creek	Pine Run to Mouth	17D	AMD	III		Affected by coal washing water from Carpentertown Coal & Coke Works; severe acid mine drainage at mouth (1, 4, 5).	22
Cowanshannock Creek		17E			Iron	Acid mine drainage & inadequately treated sewage in headwater areas; leaching coal refuse piles along the stream (1,2,3,4,5)	18

TABLE 2.1.6.-23 (Continued)

Stream	Stream Segment	CO-WAMP Sub-Basin	Class (a)	Category (b)	Problems	Causes of Problems (Parameter Group Violation) (c)	Miles of Stream Degraded By Problems
Plum Creek, North Branch	Entire Watershed, except below Keystone Lake	17E	WQL	III	Phosphorus; low pH.		
Crooked Creek	Main Stem; McKee Run to Mouth	17E	AMD	III		Aquatic biology studies indicate severe mine drainage pollution at mouth. Abandoned, unsealed mines located in this basin (1, 4, 5).	6
Buffalo Creek	Headwaters	18F			Low pH; Iron.	Acid mine drainage from strip mining in headwater areas (1, 4, 5).	5
Stony Creek	Entire Watershed (Esp. Bens, Paint, Shade, and Quemahoning Creeks)	18E				Raw sewage discharge & acid mine drainage affect Stony Creek & its tributaries, also landfill leachate (1, 2, 3, 4, 5).	20
Little Conemaugh River		18E			pH, Iron, Sulfate.	Raw sewage discharge & acid mine drainage adversely affect water quality conditions throughout most of the stream (1, 2, 3, 4, 5).	25
Johnston Run		18E				Inadequately treated municipal & industrial wastes are adversely affecting water quality (1, 2).	3
South Fork & North Branch Little Conemaugh River		18E				Raw sewage discharges & acid mine drainage problems (1, 2, 3, 4, 5).	18
Aulds Run	Entire Watershed	18D	AMD	III			
Aultmans Run	Entire Watershed	18D	AMD	III		Acid mine drainage.	
Blacklick Creek North Branch	Entire Watershed	18D	WQL	III	Iron, Suspended Solids, pH, Sulfate.	Discharge from active mines.	
Blacklick Creek	Source to Mouth	18D	AMD	III		Sewage problems due to raw discharge & malfunctioning on-lot systems; acid drainage from strip mining (1,2,3,4,5).	27
Buck Run	Entire Watershed	18D	AMD	III			
Dixon Run	Entire Watershed	18D	AMD	III		Acid mine drainage.	
Laurel Run	Entire Watershed	18D	AMD	III			
Maridis Run	Main Stem	18D	AMD	III			
Penn Run	Entire Watershed	18D	AMD	III		Acid mine drainage.	
Ramsey Run	Entire Watershed	18D	AMD	III			

TABLE 2.1.6.-23 (Continued)

Stream	Stream Segment	CO-WAMP Sub-Basin	Class (a)	Category (b)	Problems	Causes of Problems (Parameter Group Violation) (c)	Miles of Stream Degraded By Problems
Richards Run	Entire Watershed	18D	AMD	III		Acid mine drainage.	
Rummel Run	Entire Watershed	18D	AMD	III			
Tearing Run	Entire Watershed	18D	AMD	III			
Tubmill Creek	Hendricks Creek to Mouth	18D	AMD	III			
Twolick Creek, North Branch	Entire Watershed	18D	AMD	III			
Twolick Creek	Source to Mouth	18D	AMD	III		Raw sewage discharged to Creek in Homer City & Clymer areas; acid mine drainage from deep mines & strip mining in lower reaches (1, 2, 3, 4, 5).	13
Yellow Creek	Entire Watershed above Moosehill	18D	WQL	III			
Yellow Creek	Watershed Below Homer City Water Dam	18D	AMD	III		Affected by acid mine discharges from abandoned mines & runoff from refuse piles below the Homer City water reservoir (1, 4, 5).	3
Conemaugh River	Entire Stream	18C, D	AMD	III		One of the most severely polluted streams in Pennsylvania. Seriously affected by acid mine drainage in headwaters & from leachate from coal refuse piles in Seward & New Florence areas. Inadequately treated industrial wastes & sewage, particularly in the Johnstown area, add to the overall pollutional load (1, 2, 3, 4, 5).	25
Big Run	Entire Watershed	18C	AMD	III			
Blacklegs Creek	Main Stem; Source to Mouth	18C	AMD	III		Acid mine drainage.	
Crabtree Creek	Entire Watershed	18C	AMD	III		Acid mine drainage.	
Getty Run	Entire Watershed	18C	AMD	III		Acid mine drainage.	
Keystone Lake	Watershed area above Keystone Lake Dam	18C	WQL	III	Phosphorus.		
Loyalhanna Creek	Ninemile Run to Mouth	18C	AMD	III	pH, Iron.	Affected by acid mine drainage below Latrobe & malfunctioning septic tanks in New Alexandria area (1, 2, 3, 4, 5).	23
Monastery Run	Entire Watershed	18C	AMD	III			
Ninemile Run	From Bagally to Mouth	18C	AMD	III			

TABLE 2.1.6.-23 (Continued)

Stream	Stream Segment	CO-WAMP Sub-Basin	Class (a)	Category (b)	Problems	Causes of Problems (Parameter Group Violation) (c)	Miles of Stream Degraded By Problems
Saxman Run	Entire Watershed	18C	AMD	III		Acid mine drainage.	
Sulfur Run	Entire Watershed	18C	AMD	III		Acid mine drainage.	
Union Run	Entire Watershed	18C	AMD	III		Acid mine drainage.	
Whiskey Run	Entire Watershed	18C	AMD	III		Acid mine drainage.	
Beaver Run	Watershed above Beaver Run Dam	18B	WQL	III	Phosphorus; NH_3	Sewage.	
Beaver Run	Dam to Mouth	18B	AMD	III		Acid mine drainage seriously affects water quality downstream from the Beaver Run reservoir, affected by sewage above reservoir (1, 2, 3, 4, 5).	5
Big Spring Run		18B	AMD	III	pH and Iron.	Strip mines (1, 4, 5).	
Guffy Run	Entire Watershed	18B	AMD	III		Acid mine drainage.	
Kiskiminetas River	Source to Mouth	18B	AMD	III	pH and Iron.	Water quality adversely affected by acid mine drainage & raw sewage discharges the entire length of the stream (1, 2, 3, 4, 5).	27
Long Run	Entire Watershed	18B	AMD	III		Acid mine drainage.	
Wolford Run	Entire Watershed	18B	AMD	III		Acid mine drainage.	
Allegheny River	Kiskiminetas River to Mouth	18A	WQL	I	Fecal Coliform; Combined Sewers; Settleable Solids; Oil; Iron.	Water quality affected by flow from Kiskiminetas River, urban runoff and industrial wastes (1, 2, 3, 4, 5).	10
Allegheny River, Tributaries of	Kiskiminetas River to Mouth, except Pine Creek and Deer Creek	18A	WQL	III	BOD: NH_3; Oil, Suspended Solids.		
Pine Creek	Watershed above North Park Lake	18A	WQL	III	BOD: NH_3; Oil; Suspended Solids; Phosphorus.	Inadequately treated sewage & industrial wastes. Biological studies indicate good water quality upstream from Wildwood Mine, with downstream reaches biologically depressed from mine drainage (1, 2, 3, 4, 5).	6
Pine Creek	Entire Watershed, except above North Park Lake	18A	WQL	III	BOD: NH_3; Oil; Suspended Solids; Heavy Metals; Phenols.		
Deer Creek		18A			High Sulfate and Zinc levels in West Deer Township. Acid mine drainage.	Aquatic biological studies indicate upstream reaches depressed by siltation & sewage & mine drainage from Indianaola shafts (1, 2, 3, 4, 5). Landfill areas.	9

TABLE 2.1.6.-23 (Continued)

Stream	Stream Segment	CO-WAMP Sub-Basin	Class (a)	Category (b)	Problems	Causes of Problems (Parameter Group Violation) (c)	Miles of Stream Degraded By Problem
Little Deer Creek		18A			Acid mine drainage.	Water quality adversely affected, particularly from the Russelton Mine (1, 4, 5).	9
Plum Creek		18A				Water quality adversely affected by acid mine drainage & sewerage overflows (1, 2, 3, 4, 5).	7
Little Plum Creek		18A				Coal refuse disposal area.	
Willow Run		18A				Industrial discharges.	

NOTES:

(a) CLASSES:

WQL = Water Quality Limited Stream
EL = Effluent Limited Stream
AMD = Acid Mine Drainage Affected Stream

(b) CATEGORIES:

See definition in Section 2.1.6.4.

(c) PARAMETER GROUPS:

1 = Harmful substances (heavy metals, chemicals, pesticides, other toxins)
2 = Oxygen depletion
3 = Eutrophication potential (phosphorus, nitrogen)
4 = Physical modification (temperature, turbidity, suspended solids, color, flow)
5 = Salinity, acidity, alkalinity (conductivity, pH, alkalinity, total dissolved solids)

Cowanshannock Creek at Rural Valley, the lower portion of Clarion River, and Johnston Run are beset by periodic oxygen depletion and high mutrient, BOD, and suspended solids concentrations due to these wastes.

Several streams suffer from both municipal/industrial waste discharges, as well as acid mine drainage: Elk Creek in the vicinity of St. Marys, Little Toby Creek, Sandy Lick Creek, Bear Creek, Plum Creek, Pine Creek, Loyalhanna Creek, the Kiskiminetas River in the Vandergrift area, Twolick Creek, Yellow Creek, Blacklick Creek, the Little Conemaugh/Conemaugh Rivers, and Stony Creek.

An additional problem in the Upper Basin is water quality degradation caused by oil and gas well brine. The last few miles of Oil Creek, the uppermost reach of the West Branch Clarion River, and the north branch of Bear Creek are most severely affected by this problem.

High solids and turbidity, caused by water treatment plant filter backwash are the major problems in Sugar and Sandy Creeks.

The water quality of the Allegheny River itself is generally good due to the high base flow provided by Allegheny Reservoir. Because of the augmented flow the river can absorb most waste loads in the basin but localized areas of degradation caused by inadequately treated municipal and industrial discharges exist. The Tionesta area and the Ford City-Kittanning area near Emlenton are most severely affected.

4. Compliance Status

The means and maxima of the various water quality parameters at the WQN Stations are compared with the 1974 State criteria in Table 2.1.6.-24 as compiled from References (1), (2), (25), and (26). The actual concentrations listed did not meet the criteria. Criteria for pH, metals, coliforms, and phenols were most often exceeded while those for dissolved oxygen, TDS and

TABLE 2.1.6.-24 COMPLIANCE STATUS 1975 - ALLEGHENY RIVER BASIN SOURCES (1), (2), (25), (26)

GENERAL INFORMATION								SPECIFIC WATER QUALITY PARAMETERS							POTENTIAL PROBLEMS							
Station No.	Stream	Class (a)	Category (b)	CO-WAMP Subbasin	County	Criter Stand. Group (c)	Average Flow cfs	pH S.U.	D.O. mg/l	TOT.Fe mg/l	TEMP. °C	TDS mg/l	ODOR S.U.	Total Colif. /100ml	ALL VALUES GIVEN AS mg/l					Overall Quality Rating	Will Stream Meet Water Quality Standards By 1933?
								mean/max.													
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
801	Allegheny River	EL	I	18A	Westmoreland	B+h,k	20775	OK/ 4.7	OK	5/ 13.4	OK	OK	34/55	12300/ 123500	Phenol .026/ .110	Al 3.4/21	Zn .062/ .062	SO_4 OK/300	Mn 1.5/26	Fair	No. Inadequate funds to correct acid & iron problems in the Kiskiminetas River.
802	Allegheny River	AMD	III	17E	Armstrong	B	14113	OK/OK	OK	OK/3	OK	OK		7800/ 169700	Phenols OK/.036	Al 4.1/14	Tot.Alk 9229/ 800000			Fair to good	
803	Allegheny River	AMD	III	17C	Armstrong	B+h, j_1, o_1	12927	OK/OK	OK	OK/ 10.0	OK	OK	30/37	32600/ 818200	Phenols .022/ .05					Good	
804	Allegheny River	EL	II	16G	Venango	B+h, j_1,o_1	9019	OK/OK-8.8	OK	OK/14	OK	OK	38/45	59400/ 537400	SO_4 OK/ 296.0					Good	
805	Allegheny River	EL	II	16F	Forest	B+h, j_1, o_1	6347	OK/OK	OK/O	OK/ 3.6	OK	OK	34/47	11600/ 165600	Ni .111/ .111					Good	
808	Buffalo Creek	WQL	I	18F	Armstrong	B-b_2 +b_6	193	OK/ 4.5	OK/O	OK/ 9.6	OK	OK		49300/ 350000	Al 3.6/ 12					Fair	No. Lack of fund
809	Kiskiminetas River	AMD	III	18B	Westmoreland	B+v_2	3330	4.3/3	OK/.8	8.8/ 32	OK	OK/ 760	NH_3-N OK/ 1.8	250/ 3500	Phenol OK/.040	Al 10.7/ 53	Zn .647/ .870	Ni .170/ .230	Mn 3.9/20	Poor	No. Lack of fund for mine drainage projects.
810	Conemaugh River	AMD	III	18C	Indiana	B+v_2	2477	4.2/3	OK/.8	7.9/ 28	OK	OK	NH_3-N OK/ 2.6	60/ 1400	Phenol OK/.030	Al 9.9/43	Zn 1.030/ 1.030	Ni .150/ .150	SO_4 299/950	Poor	No. Lack of fund for mine drainage projects, ar lack of federal grants for sewage facilities.
811	Conemaugh River	AMD	III	18D	Westmoreland	B+v_2	1318	4.9/ 3.9	OK	13.1/ 58	OK	OK	NH_3-N OK/ 4.4	2500/ 24000	Phenols .039/ .090	Al 8.5/25	Zn 1.063/ 1.960	Ni .166/ .180	CN 1.069/ 1.069		
812	Loyalhana Creek	AMD	III	18C	Westmoreland	B+v_2	381	4.8/3	OK	7.9/ 80	OK	OK		1400/ 27000	Al 10/57	Zn .050/ .050	SO_4 341/ 1350			Severely depressed	Yes.

NOTES: (a) Classes: WQL = Water Quality Limited Stream
EL = Effluent Limited Stream
AMD = Acid Mine Drainage Affected Stream

(b) Categories: See definition in text, Section 2.1.6.4.
(c) 1974 Pa. Water Quality Criteria Groups and Levels as defined in Reference (28).
(d) Data Source: USGS Water Resources Bulletin No. 1.
(e) Discontinued.

TABLE 2.1.6.-24 (Continued)

GENERAL INFORMATION								SPECIFIC WATER QUALITY PARAMETERS							POTENTIAL PROBLEMS						
Station No.	Stream	Class (a)	Category (b)	CO-WAMP Sub-basin	County	Criter Stand. Group (c)	Average Flow cfs	pH S.U.	D.O. mg/l	TOT.Fe mg/l	TEMP. °C	TDS mg/l	ODOR S.U.	Total Colif. /100ml	ALL VALUES GIVEN AS mg/l					Overall Quality Rating	Will Stream Meet Water Quality Standards By 1983?
								mean/max.													
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
813	Loyal-hana Creek	AMD	III	18C	West-more-land	$B+v_2$	329	OK/ 4.6	OK	OK/ 9.0	OK	OK		16500/ 240000	Phenols .020/ .050	Al 3.2/57	Zn OK/.060	Mn OK/10		Good to excell-ent	Yes.
814	Black Lick Creek	AMD	III	18D	Indi-ana	$C+v_1$	422	3.6/ 2.8	OK/ 3.0	62.9/ 300	OK/27	OK	NH_3-N OK/.8	OK/OK	Al 25/136	Zn .280/ .280	Ni .120/ .120	SO_4 574/ 2325	Mn 2.3/7.0	Poor	No. Lack of funds for mine drain-age abatement pro-jects and lack of federal grants for sewage faci-lities.
815	Two Lick Creek	AMD	III	18D	Indi-ana	$C+v_1$	254	4.2/3	OK/2.7	20/75	OK	OK		1100/ 21100	Al 9.1/56	Zn .095/ .140	SO_4 331/ 1040	Mn 2.0/ 5.5	NH_3-N .54/1.4	Poor	Yes- Above Homer City area; No- below Homer City due to lack of funds for mine drainage control.
818	Crook-ed Creek	AMD	III	17E	Arm-strong	$B+v_2$	503	5.8/ 3.4	OK	1.9/ 1.4	OK	OK		1200/ 16500	Phenols OK/ .040	Al 2.7/14	Zn .050/ .080	SO_4 OK/520		Poor at mouth	No. Inadequate funds to complete acid mine drain-age control.
819	Mahon-ing Creek	AMD	III	17D	Arm-strong	$B+v_2$	654	OK/ 5.8	OK	OK/2.	OK	OK		52200/ 800100	Phenols .035/ .150	Al 3.6/14	Zn .137/ .330				Yes.
820	Red-bank Creek	AMD	III	17C	Clarion	$C+v_1$	758	OK/ 4.5	OK/ 1.0	OK/ 14.0	OK/28	OK		12700/ 186100	SO_4 OK/225	Al OK/2.8	Phenol OK/.023			Poor near mouth	No. Low priority for upgrading treatment facili-ties at Summer-ville.
821	Clar-ion River	AMD	III	17E	Clarion	A+h	1739	5.6/ 4.5	OK/ 4.1	OK/ 3.4	OK/25	OK	32/ 54	300/ 3900	Mn 3.7/ 3.7	Zn 1.6/ 1.6	Al OK/2.6	Phenol OK/.04(		Poor	No. Lack of funds for mine drain-age control pro-jects.
822	Clar-ion River	AMD	III	17B	Clarion	A+h	1427 (d)													Poor	

NOTES: (a) Classes: WQL = Water Quality Limited Stream
EL = Effluent Limited Stream
AMD = Acid Mine Drainage Affected Stream

(b) Categories: See definition in text, Section 2.1.6.4.
(c) 1974 Pa. Water Quality Criteria Groups and Levels as defined in Reference (28
(d) Data Source: USGS Water Resources Bulletin No. 1.
(e) Discontinue

TABLE 2.1.6.-24 (Continued)

GENERAL INFORMATION								SPECIFIC WATER QUALITY PARAMETERS							POTENTIAL PROBLEMS					Overall Quality Rating	Will Stream Meet Water Quality Standards By 1983?
Station No.	Stream	Class (a)	Category (b)	CO-WAMP Sub-basin	County	Criter Stand. Group (c)	Average Flow cfs	pH S.U.	D.O. mg/l	TOT.Fe mg/l	TEMP. °C	TDS mg/l	ODOR S.U.	Total Colif. /100ml	ALL VALUES GIVEN AS mg/l						
								mean/max.													
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
823	Clarion River	AMD	III	17A	Elk	A+h	330	OK/ 5.3	OK/ 4.4	OK/ 1.8	OK/46* *Questionable	OK	37/64	133600/ 460000	Cu .408/ .796	Ni 1.65/ 1.65	Zn .231/ .392			Good	Yes.
824	West Branch Clarion River	AMD	III	17A	Elk	A+h	101	OK/ 5.9	OK	OK/ 2.2	OK/ 26	OK	28/54	61500/ 430000	Cl OK/540						
825	East Branch Clarion River	AMD	III	17A	Elk	A $-b_1+$ b_3,h	111	5.6/ 4.2	OK	OK/ 2.0	OK/ 22.5	OK	OK/44	OK/OK	Zn .084/ .160						
826	French Creek	WQL	II	16D	Venango	B+h, j_1,v_2	1222	OK	OK	OK/ 10.0	OK	OK	29/43	28000/ 137500	Ni .128/ .128	Phenol .033/ .080					
828 (e)	Oil Creek	EL	II	16E	Venango	A+h	344	OK/ 9.0	OK	OK/ 3.0	OK/ 27	OK	37/57	24200/ 550000	Phenol OK/.03					Good	No. Regulations governing crude oil recovery probably will not b implemented by then.
829	Tionesta Creek	EL	II	16F	Forest	A	801	OK/OK	OK/ 4.0	OK/ 2.0	OK/27	OK		1200/ 12000							
830	Tionesta Creek	EL	II	16F	Forest	A	392	OK/ 2.5	OK/0	OK/ 2.4	OK/29	OK		34800/ 845000							
833	Clarion River	AMD	III	17A	Elk	A+h	519	OK	OK	OK	OK/25	OK	35/47	29800/ 160900	Phenol 24/30					Good	
835 (e)	Mahoning Creek	AMD	III	17D	Jefferson	B+v_2	264 (d)													Fair	Yes.

NOTES: (a) Classes: WQL = Water Quality Limited Stream
EL = Effluent Limited Stream
AMD = Acid Mine Drainage Affected Stream

(b) Categories: See definition in text, Section 2.1.6.4.
(c) 1974 Pa. Water Quality Criteria Groups and Levels as defined in Reference (2
(d) Data Source: USGS Water Resources Bulletin No. 1.
(e) Discontinu

TABLE 2.1.6.-24 (Continued)

GENERAL INFORMATION								SPECIFIC WATER QUALITY PARAMETERS							POTENTIAL PROBLEMS						
Station No.	Stream	Class (a)	Category (b)	CO-WAMP Subbasin	County	Criter Stand. Group (c)	Average Flow cfs	pH S.U.	D.O. mg/l	TOT.Fe mg/l	TEMP. °C	TDS mg/l	ODOR S.U.	Total Colif. /100ml	ALL VALUES GIVEN AS mg/l					Overall Quality Rating	Will Stream Meet Water Quality Standards By 1983?
								mean/max.													
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
838	Pine Creek	WQL	I	18A	Allegheny	$B-b_2, +b_5, e_2$	1033 (d)	OK	OK	2.4/ 10.9	OK	OK			Zn .100/ .100	Ni .150/ .150	SO_4 254/ 725	CN .140/ .548	NH_3-N OK/.6	Good upstream from Wildwood Mine; depressed downstream	Yes.
839	Deer Creek	WQL	I	18A	Allegheny	A	42 (d)	OK	OK	OK	OK/ 20	OK			Zn .055/ .090	SO_4 OK/490	Tot.Alk 147/270			Depressed upstream, some recovery downstream	Yes.
840 (e)	Buffalo Creek	WQL	I	18F	Butler	$B-b_2 +b_6$		OK/ 5.8	OK	OK	OK	OK								Poor	No. Lack of funds.
841	Cowanshannock Creek	AMD	III	17E	Armstrong	$B+v_2$		OK	OK	OK/ 1.8	OK	OK								Poor	No, Lack of funds for mine drainage abatement & treatment.
842 (e)	Mahoning Creek	AMD	III	17D	Armstrong	$B+v_2$	582 (d)	OK	OK	OK	OK	OK								Poor	Yes.
843	Clarion River	AMD	III	17B	Clarion	A+h	2252 (d)	5.6/ 5.7	OK	OK/ 2.8	25/ 27	OK			SO_4 OK/425	Mn 2.6/ 2.6	Zn .1/ .1			Poor	
844	Elk Creek	AMD	III	17A	Elk	A+h	291 (d)	OK	OK	OK	OK/ 22	OK								Fair	No. Lack of funds for mine drainage control projects.
845	French Creek	WQL	II	16D	Venango	$B+h, j_1, v_2$	265 (d)	OK/ OK- 8.7	OK	OK/ 2.5	OK	OK									

NOTES: (a) Classes: WQL = Water Quality Limited Stream
EL = Effluent Limited Stream
AMD = Acid Mine Drainage Affected Stream

(b) Categories: See definition in text, Section 2.1.6.4.
(c) 1974 Pa. Water Quality Criteria Groups and Levels as defined in Reference (28).
(d) Data Source: USGS Water Resources Bulletin No. 1.
(e) Discontinued.

TABLE 2.1.5.-24 (Continued)

GENERAL INFORMATION								SPECIFIC WATER QUALITY PARAMETERS							POTENTIAL PROBLEMS						
Station No.	Stream	Class (a)	Category (b)	CO-WAMP Subbasin	County	Criter Stand. Group (c)	Average Flow cfs	pH S.U.	D.O. mg/l	TOT.Fe mg/l	TEMP. °C	TDS mg/l	ODOR S.U.	Total Colif. /100ml	ALL VALUES GIVEN AS mg/l					Overall Quality Rating	Will Stream Meet Wate[r] Quality Standar[d] By 1983?
								mean/max.													
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
848 (e)	Lake Creek	WQL	II	16D	Venango	$B+v_2$		OK	OK	OK	OK	OK									
852	Oil Creek	EL	II	16E	Venango	A+h	517 (d)	OK	OK	OK/ 1.7	22/26	OK			Pb .5/.5					Good	No. Regulations governing crude oil recovery pr[o]bably will not [be] implemented by then.
853 (e)	Tionesta Creek	EL	II	16F	Forest	A	873 (d)	OK	OK	OK	23/24	OK									

NOTES: (a) Classes: WQL = Water Quality Limited Stream
EL = Effluent Limited Stream
AMD = Acid Mine Drainage Affected Stream

(b) Categories: See definition in text, Section 2.1.6.4.
(c) 1974 Pa. Water Quality Criteria Groups and Levels as defined in Reference (?
(d) Data Source: USGS Water Resources Bulletin No. 1.
(e) Discontin[ued]

odor were mostly satisfied. Overall, the water quality standards were met on less than half of the total stream mileage in the basin and several of the streams were in poor condition -- mostly due to the abandoned mine drainage problem.

Between July 1, 1975 and June 30, 1976 the water quality of the Allegheny River at Oakmont exceeded ORSANCO's criteria (or ORBC's if no ORSANCO criteria were available) for the parameters tabulated below (37).

Parameter	pH	Total Suspended Solids	Fecal Coliforms for Recreation	Total Phosphorus	Phenol	Iron
% of Samples (or time) exceeding ORSANCO/ORBC Criteria	1	3	100	10	3	57

DER estimates that, as the result of continued cleanup efforts, Loyalhanna Creek, Two Lick Creek above Homer City, Mahoning Creek, Clarion River, Pine Creek, and Deer Creek will meet the standards by 1983 (29).

Lack of sufficient funds for mine drainage control projects will prevent attainment of the standards on several streams and the following waters were judged so polluted by acid mine drainage that implementation of some effluent limitations to meet water quality standards has been postponed (35):

Stream Name	County
Kiskiminetas River	Armstrong, Indiana, Westmoreland
Guffy Run	Armstrong
Beaver Run, dam to mouth	Westmoreland
Wolford Run	Westmoreland
Long Run	Armstrong
Sulfur Run	Indiana
Blacklegs Creek, main stem from source to mouth	Indiana
Big Run	Armstrong, Indiana
Whiskey Run	Indiana
Getty Run	Westmoreland
Union Run	Westmoreland
Conemaugh River	Indiana, Westmoreland
Aultmans Run	Indiana
Blacklick Creek	Indiana
Two Lick Creek, from Yellow Creek to mouth	Indiana
Tearing Run	Indiana

Yellow Creek, Homer City water dam to mouth	Indiana
Laurel Run	Indiana
Aulds Run	Indiana
Ramsey Run	Indiana
Mardis Run	Indiana
Rummel Run	Indiana
Pine Run	Armstrong
Crooked Creek below dam	Armstrong
Glade Run	Armstrong
Redbank Creek from St. Charles to mouth	Armstrong

5. Stream Quality Changes, 1973-77

Tables 2.1.6.-25 and 2.1.6.-26 summarize the stream lengths showing improvement or degradation, respectively, in water quality during the last five years in the Allegheny River Basin along with the reason for the improvement or degradation (25).

ORSANCO performed a short-term trend analysis of water quality by comparing the 1964-75 data to the 1975-76 data from the quality monitor on the Allegheny River at Oakmont (37). Temperature, pH and specific conductance showed no statistically significant changes but there was an increasing trend in the dissolved oxygen concentrations at the 0.001 level of significance.

TABLE 2.1.6.-25

STREAMS SHOWING WATER QUALITY IMPROVEMENTS (1973-1977)
ALLEGHENY RIVER BASIN
SOURCE (25)

Year	Stream	County	Length Improved Miles	Reason for improvement
1973	Little Toby Creek	Jefferson	0.1	Sewage treatment
	Frencn Creek	Crawford	2.5	Sewage and industrial waste treatment
	French Creek	Venango	0.5	Industrial waste treatment
	Clarion River	Elk	1.0	Improved industrial waste treatment
	Allegheny River	Warren	20	Recovery from 1972 spill
	Allegheny River	Venango	8	Improved industrial waste treatment
	Lower Two Mile Run	Venango		Improved industrial waste controls
	Mason Creek	Elk	0.75	Landfill leachate problem corrected
	Allegheny River	*Warren	1.0	Industrial waste discharge stopped
	Tunungwant Creek	*McKean	2.0	Industrial connections to sewer system
	Oil Creek	Venango	1.0	Improved industrial waste treatment
	Caylor Run	Jefferson	1.0	Strip mine restoration
	Linesville Creek	Crawford	0.5	Industrial connection to sewer system
	Deer Creek	Allegheny	1.5	Landfill operation halted
	Pine Creek	Allegheny	1.5	Partial sealing of abandoned mine
	Little Conemaugh	Cambria	5	Coal refuse runoff treatment
	Saltlick Run	Cambria	5	Elimination of industrial discharge

*Erie, McKean, Potter and Warren Counties are not in the ORBES Region.

TABLE 2.1.6.-25 (Continued)

Year	Stream	County	Length Improved Miles	Reason for Improvement
	Stony Creek	Cambria	6	Sewage treatment
	Elk Creek	Cambria	8	Improved mine drainage treatment
	Big Conneautte Creek	*Erie	1.75	Improved sewage treatment
1974	Redbank Creek	Clarion-Armstrong border	3	Mine drainage abatement
	Mahoning Creek	Jefferson	2	Improved sewage treatment
	French Creek	Crawford	1	Improved industrial waste treatment
	Allegheny River	*Warren	1	Sewage treatment
	Crooked Creek	Indiana	19	Mine drainage abatement
1975	French Creek	Crawford	0.25	Industrial waste discharge abated
	Unnamed Tributary of Redbank Creek	Jefferson	0.5	Industrial waste discharge abated
	Mahoning Creek	Jefferson	2	Industrial waste discharge abated
	Elk Creek	Cambria	4	Mine drainage abatement
	Dutch Run/North Branch Blacklick Creek	Cambria	7	Improved industrial waste treatment
	South Branch Blacklick Creek	Cambria	3	Sewage treatment
	Pine Creek	Allegheny	8	Regionalized sewage treatment
	West Branch Deer Creek	Allegheny	3	Improved sewage treatment
	Allegheny River	Armstrong	1	Improved sewage treatment
1976	Little Paint Creek	Cambria	3.5	Sewage Treatment
	Stony Creek	Somerset	0.5	Sewage Treatment
	Wells Creek	Somerset	2.5	Sewage Treatment

*Erie, McKean, Potter and Warren Counties are not in the ORBES Region.

TABLE 2.1.6.-25 (Continued)

Year	Stream	County	Length Improved Miles	Reason for Improvement
	Allegheny River	Allegheny	2.6	Improved industrial waste treatment
	Little Plum Creek	Allegheny	4	Improved industrial waste treatment
	Haskins Run	Armstrong	2	Mine drainage abatement
	Cowanshannock Creek	Armstrong	11	Mine drainage abatement
	Kiskiminetas River	Armstrong & Westmoreland	1	Sewage treatment
	South Branch Bear Creek	Butler	1	Industrial discharge abated
	Pine Creek	Allegheny	3	Connections to regional sewer system
	French Creek	Crawford	0.5	Industrial connection to sewer system
	Tunungwant Creek	*McKean	0.5	Improved sewage treatment
	Allegheny River	Venango	0.5	Improved industrial waste treatment
	Allegheny River	*Warren	1.0	Improved sewage treatment
	South Branch Tionesta Creek	*Warren	0.25	Sewage treatment
	Unnamed Tributary of Caldwell Creek	*Warren	0.5	Sewage treatment
1977	Conemaugh River	Cambria	2.0	Industrial waste treatment & partial plant shut down
	Wells Creek	Somerset	0.5	Connection of industrial waste to municipal system
	Allegheny River	Armstrong	1	Sealing of mine
	Redbank Creek	Clarion	1	Improved sewage treatment
	Allegheny River	Venango	0.5	Industrial waste treatment
	Oil Creek	Venango	0.5	Industrial waste treatment
	Buck Lick Run & Chappel Fork	*McKean	3.5	Stream has recovered from 1976 crude oil spill

*Erie, McKean, Potter, and Warren Counties are not in the ORBES Region.

TABLE 2.1.6.-26

STREAMS SHOWING WATER QUALITY DEGRADATION (1973-1977)
ALLEGHENY RIVER BASIN
SOURCE (25)

Year	Stream	County	Length Degraded Miles	Reason for Degradation
1973	Tributary to Buck Lick Run	*McKean	0.1	Siltation (oil drilling)
	Pine Creek	Allegheny	4.0	Industrial waste discharge
1974	Dutch Run and North Branch Blacklick Creek	Cambria	7	Mine drainage discharge
1975	Cooney Run	Indiana	3	Pesticide spill
1976	Sugar Run	Armstrong	2	Mine drainage
	Huling Run	Armstrong	3	Mine drainage
	Allegheny River	Armstrong	1	Breakout of mine seal
	Blacklick Run & Chappel Fork	*McKean	3.5	Crude Oil spill
	Allegheny River	*Potter	0.5	Overloaded sewage treatment plant
1977	Conemaugh River & Tributaries	Cambria	10.0	Johnstown flood
	Linesville Creek	Crawford	0.5	Spill of paint thinner
	East Sandy Creek	Clarion	1.5	Spill of wood preservative
	Mahoning Creek	Jefferson	1.5	Discharge of raw sewage due to flood
	Upper Sheriff Run	*McKean	0.5	Oil pipeline break
	Tunungwant Creek	*McKean	0.5	Overloaded secondary sewage facilities

*McKean and Potter Counties are not in the ORBES Region.

C. Ohio River Main Stem Basin

1. General

The waters of the Ohio River main stem and its tributaries in Pennsylvania, in their natural state, are moderately hard to hard, depending on the season of the year (36). However, the quality of the Ohio River is largely determined by three major factors:

(a) the contributions of the Allegheny and Monongahela Rivers;

(b) the waste residues discharged in the Pittsburgh metropolitan area; and

(c) the contributions of the tributaries below Pittsburgh.

In the 195's and 1960's many of the smaller tributaries carried substantial quantities of sulfuric acid into the Allegheny and Monongahela River, lowering their pH and, consequently, of the Upper Ohio River frequently to values less than 5.0 (30), (36). Various other changes in water quality are affected by municipal sewage, industrial wastes, and non-point runoff in the Pittsburgh metropolitan area. The average daily loads of various components contributed to the Ohio River by the Allegheny and Monongahela Rivers during the year October 1, 1974 - September 30, 1975 are summarized in Table 2.1.6.-27 (17). The Allegheny River contributed more load in most of the components, which can be expected because of its greater average flow. However, the loads of alkalinity, manganese, chloride and total phosphate were much greater than what could be due to the higher flow. On the other hand, the Monongahela River, in spite of its lower average flow, contributed greater loads of phenols and ammonia nitrogen.

The effect of the contributions from the Allegheny and Monongahela Rivers becomes more pronounce with decreasing discharges in the Ohio River: pH and dissolved oxygen are lowest, while the concentration of other com-

TABLE 2.1.6.-27

CONTRIBUTIONS TO THE OHIO RIVER BY THE ALLEGHENY AND MONONGAHELA RIVERS SOURCE (17)

PARAMETER	AVERAGE DAILY LOAD (TONS/DAY)* DURING Oct. 1, 1964 - Sept. 30, 1965	
	FROM ALLEGHENY RIVER	FROM MONONGAHELA RIVER
Flow (cfs)	17,100	10,100
Dissolved Oxygen	572	314
Acidity (as $CaCO_3$)	153	151
Alkalinity (as $CaCO_3$)	554	198
Hardness (as $CaCO_3$)	3,900	2,910
Calcium	1,010	801
Magnesium	348	216
Manganese	46	21
Sulfate	4,500	4,020
Chloride	683	272
BOD	57	32
Total Iron	102	80
Phenols (pounds/day)	278	1,550
Surfactants (ABS)	2.5	1.8
Total Organic Carbon	272	191
Total phosphate	88	29
Sodium	555	502
Potassium	91	58
Ammonia-Nitrogen	7	15
Organic Nitrogen	22	17
Total Solids	12,500	8,740

*Except flow and phenols

ponents are usually highest during the low flow period of the year, generally in late September (14), (17), (36).

Significant changes in water quality are affected by the municipal and industrial wastes reaching the Ohio River from the Pittsburgh metropolitan area. Table 2.1.6.-28 summarizes the results of a study which evaluated the changes in loads of various components in the lower Allegheny River (Mile 45.1 to Pittsburgh Point), the lower Monongahela River (Mile 13.3 to Pittsburgh Point), and the upper Ohio River (Pittsburgh Point to Mile 25.2) during October 1, 1964 - September 30, 1965 (17). The results indicate that there was a general increase in the pollution loads in the waters of the three rivers as they proceed downstream through the study area (which comprised most of Allegheny County). Of major importance, at the time of study, was the great reduction in dissolved oxygen in the Ohio River which produced a critical reach below Pittsburgh where dissolved oxygen levels were often less than 4.0 mg/l during periods of low flows.

Conditions have greatly improved since 1965 due to increasing municipal and industrial pollution control in the basin (especially the upgrading of ALCOSAN to secondary treatment in 1974), and to low flow augmentation from storage reservoirs in the Allegheny and Monongahela River Basins (as discussed in previous sections). In 1974 the Corps of Engineers conducted a study on the effects of navigational dams on the water quality of the upper Ohio River. The Emsworth, Dashields, and Montgomery Dams were found to have an extremely beneficial effect on the dissolved oxygen concentration and it was recommended that the operation schedules of all spillway gates be re-examined to determine the feasibility of increasing aeration at low flows (38). The new operating procedures, since implemented, will probably result in further improvements in the dissolved oxygen levels in the Ohio River.

TABLE 2.1.6.-28 CHANGES IN MEAN STREAM LOADS IN THE PITTSBURGH, PA STUDY AREA (Tons/day, except Phenols) Source (17)

Parameter	Allegheny R. ΔA	Monongahela R. ΔB	Ohio R. ΔC	Total Study Area ΔD
Dissolved Oxygen	+65	+2	-91	-24
Acidity(as $CaCO_3$)	-272	-135	-47	-454
Alkalinity($CaCO_3$)	-150	+93	+44	-13
Hardness ($CaCO_3$)	+702	+408	-111	+999
Calcium	+183	+143	+4	+330
Magnesium	+66	+12	-21	+57
Manganese	+2	+3	+1	+6
Sulfate	+789	+289	+296	+1,374
Chloride	+113	+100	+54	+267
BOD	-4	+6	+24	+26
Total Iron	+41	0	-2	+39
Phenols (lbs/day)	+86	+1,470	+289	+1,845
Surfactant	+0.8	+1.1	+3.0	+4.9
TOC	+51	+59	-15	+95
Total Phosphate	+27	-9	+1	+19
Sodium	+148	+131	+18	+297
Potassium	+16	+27	0	+43
Ammonia Nitrogen	-2	+10.6	+7	+15.6
Organic Nitrogen	+11	+7	-7	+11
Total Solids	+3,955	+2,283	-2,883	3,335

ΔA = Difference in mean daily loads between the Allegheny River at its mouth and the sum of the loads in the Allegheny River at Kittanning, PA and in the Kiskiminetas River at Apollo, PA.

ΔB = Difference in mean daily loads between the Monongahela River at its mouth and the sum of the loads in the Monongahela River at Belle Vernon, PA and in the Youghiogheny River at West Newton, PA.

ΔC = Difference in mean daily loads between the Ohio River at Rochester, PA and the sum of the loads from the Allegheny and Monongahela Rivers.

ΔD = Total net change of average daily loads in study area = ΔA + ΔB + ΔC.

The major industrial sources of wastes reaching the upper Ohio River in the greater Pittsburgh area are the basic steel and metal finishing industries, inorganic and organic chemical manufacturing, coking, and power plants. These and the municipal waste sources and their treatment will be discussed in more detail in Section 2.1.6.5.

Mine drainage from bitumenous coal mining operations as well as municipal and industrial wastes also reach the Ohio River through many of its tributaries in Pennsylvania. The major tributary is the Beaver River which also receives the flow of the polluted Mahoning River from Ohio.

There are four reservoirs in the headwater areas of the tributaries to the Beaver River which provide partial low flow augmentation which has some effect on the water quality of the Ohio River in Pennsylvania. Three of these: Berlin, Mosquito Creek, and West Branch Mahoning Reservoirs are located in Ohio and are operated by the Corps of Engineers to improve the water quality in the Mahoning River Valley, particularly at Youngstown. Shenango Reservoir on the Shenango River immediately above Sharpsville, PA, stores 29,900 acre-feet of inflow for release during the summer month to improve the water quality in the Shenango and Beaver Rivers (32).

2. Surface Water Quality

The yearly averages and ranges of temperature, conductivity, dissolved oxygen and pH are shown for the Ohio River at South Heights, PA in Figure 2.1.6.-29. The average monthly values of the same parameters for the last eight years at the same station are shown in Figure 2.1.6.-30. Similar information for the Beaver River at Beaver Falls, PA, is presented in Figures 2.1.6.-31 and 2.1.6.-32. The data for these four figures were calculated from ORSANCO's Robot Monitor Computer Printouts (6).

The mean values of selected parameters for a twelve-year period (June 1962 through December 1974) at the PA WQN Stations in the basin are presented

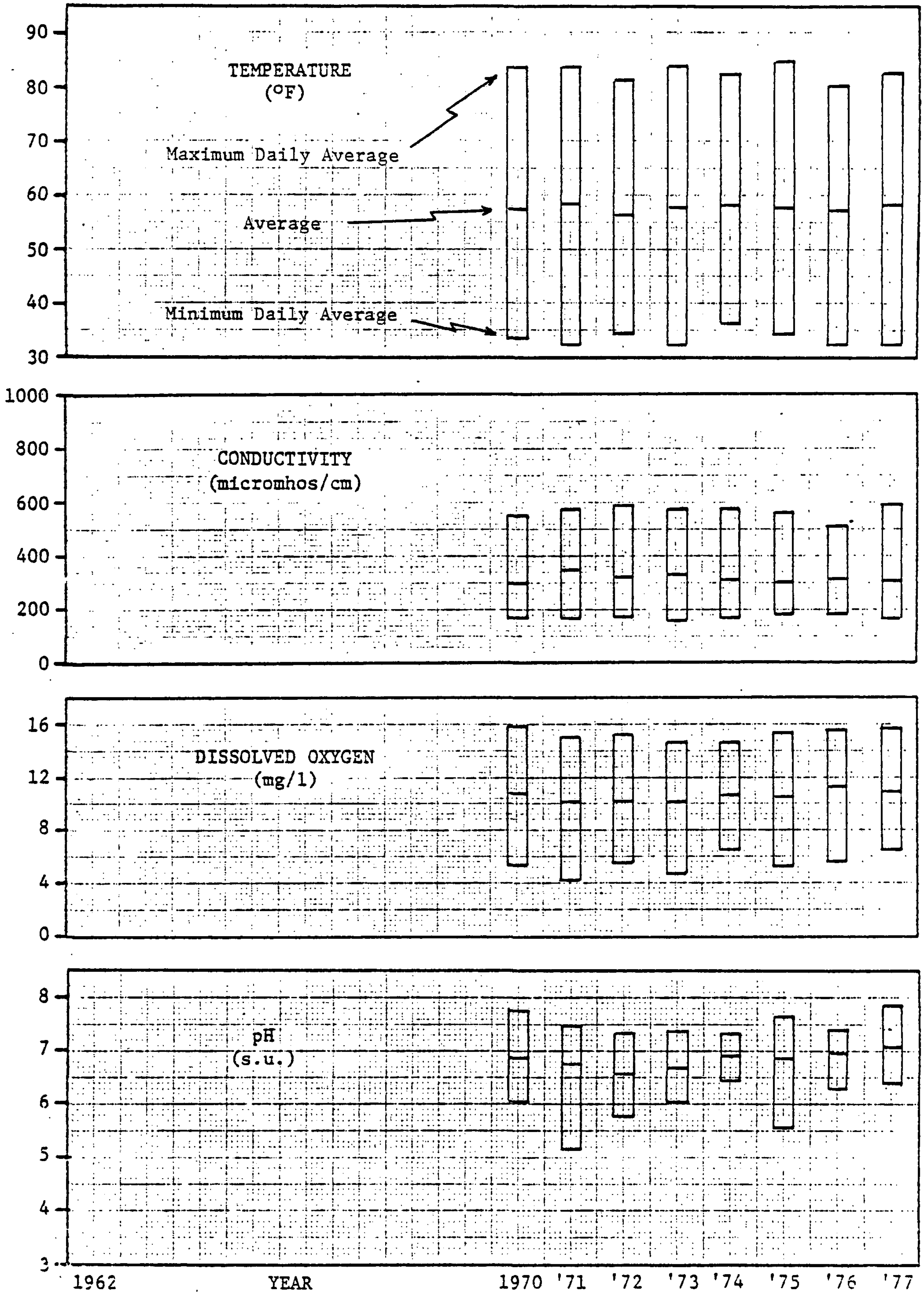


FIGURE 2.1.6.-29 ANNUAL WATER QUALITY -- OHIO RIVER AT SOUTH HEIGHTS (6)

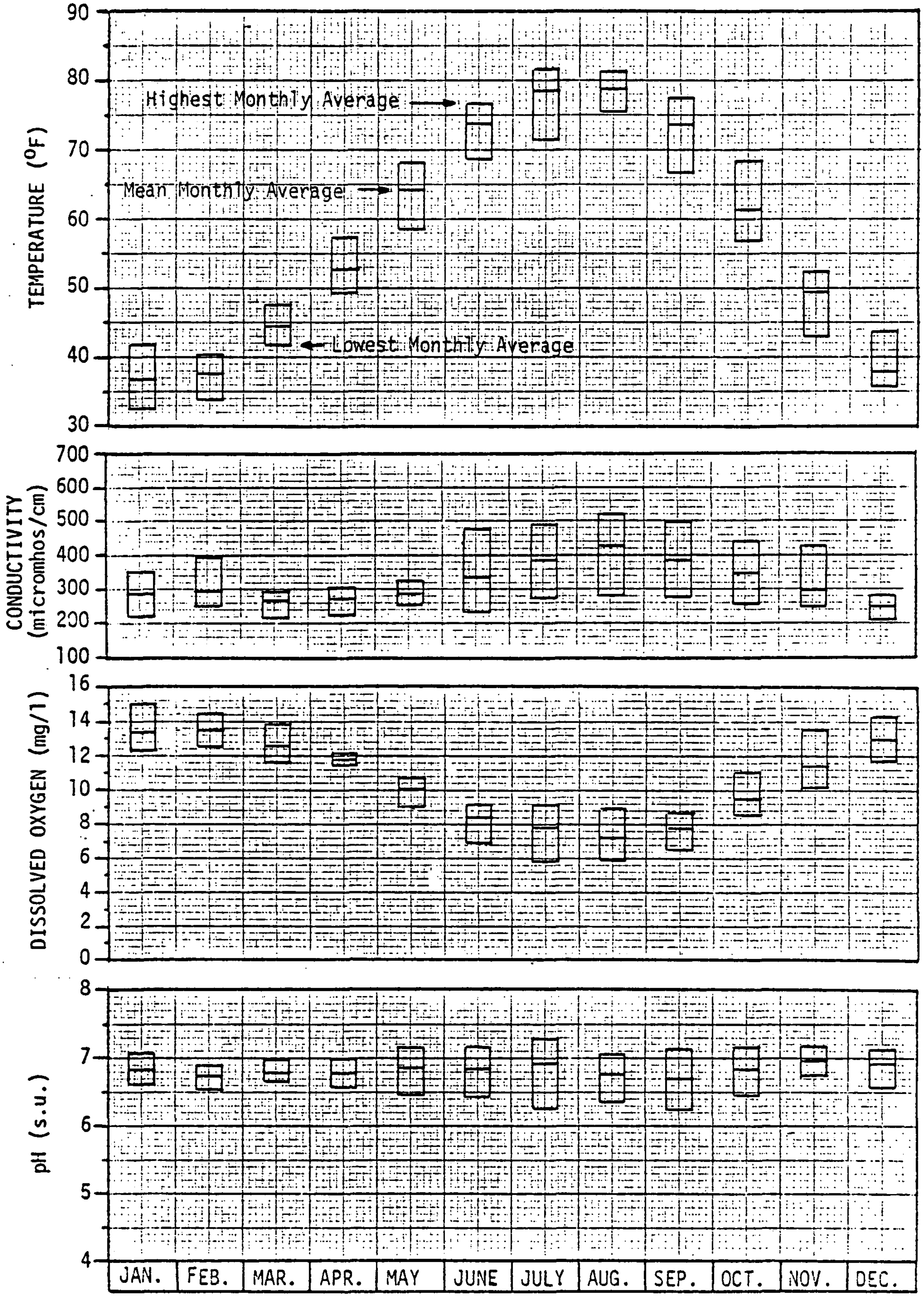


FIGURE 2.1.6.-30 SEASONAL VARIATION OF WATER QUALITY: MONTHLY AVERAGES - OHIO RIVER AT SOUTH HEIGHTS, 1970-77 After Source (6)

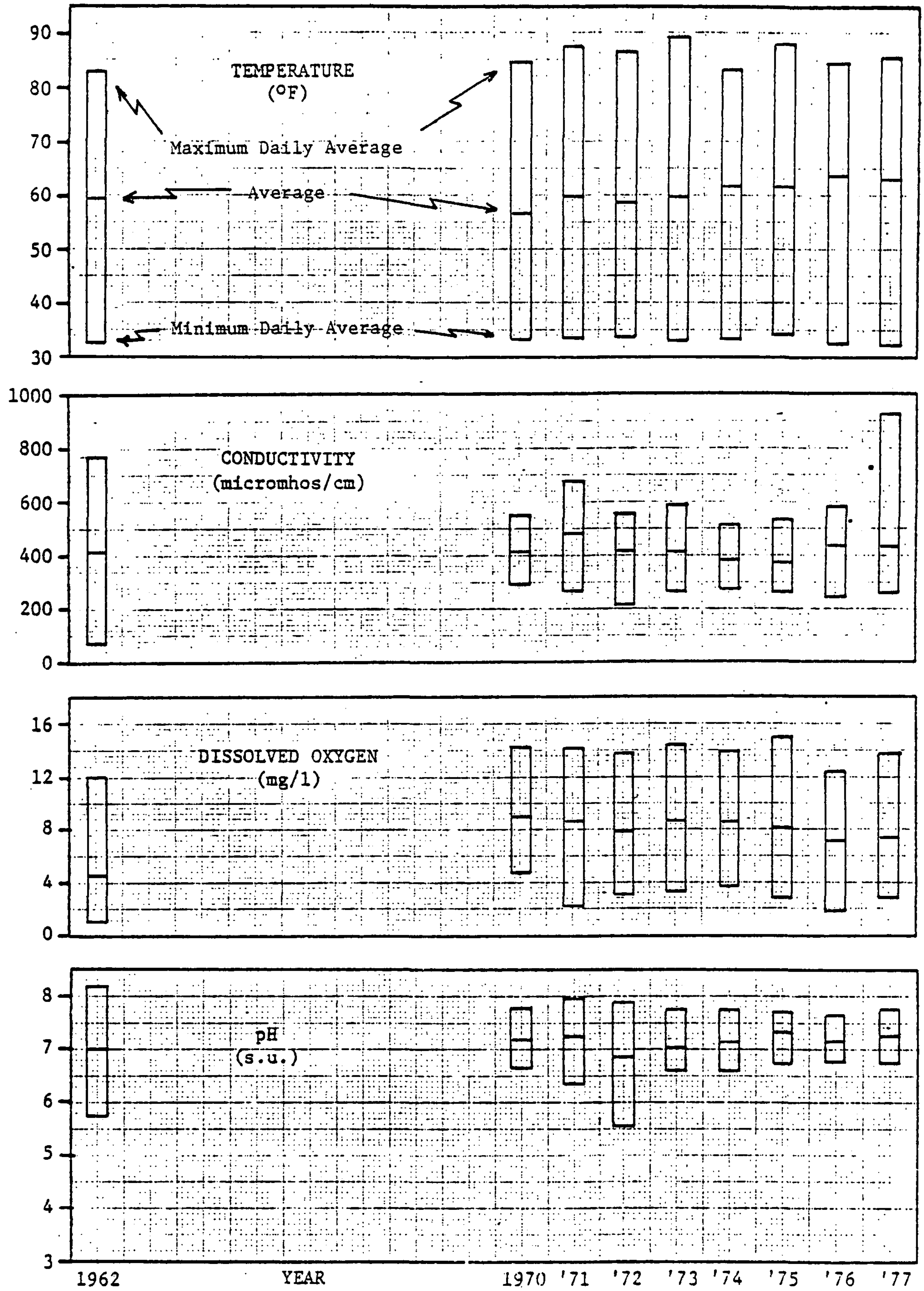


FIGURE 2.1.6.-31 ANNUAL WATER QUALITY -- BEAVER RIVER AT BEAVER FALLS (6)

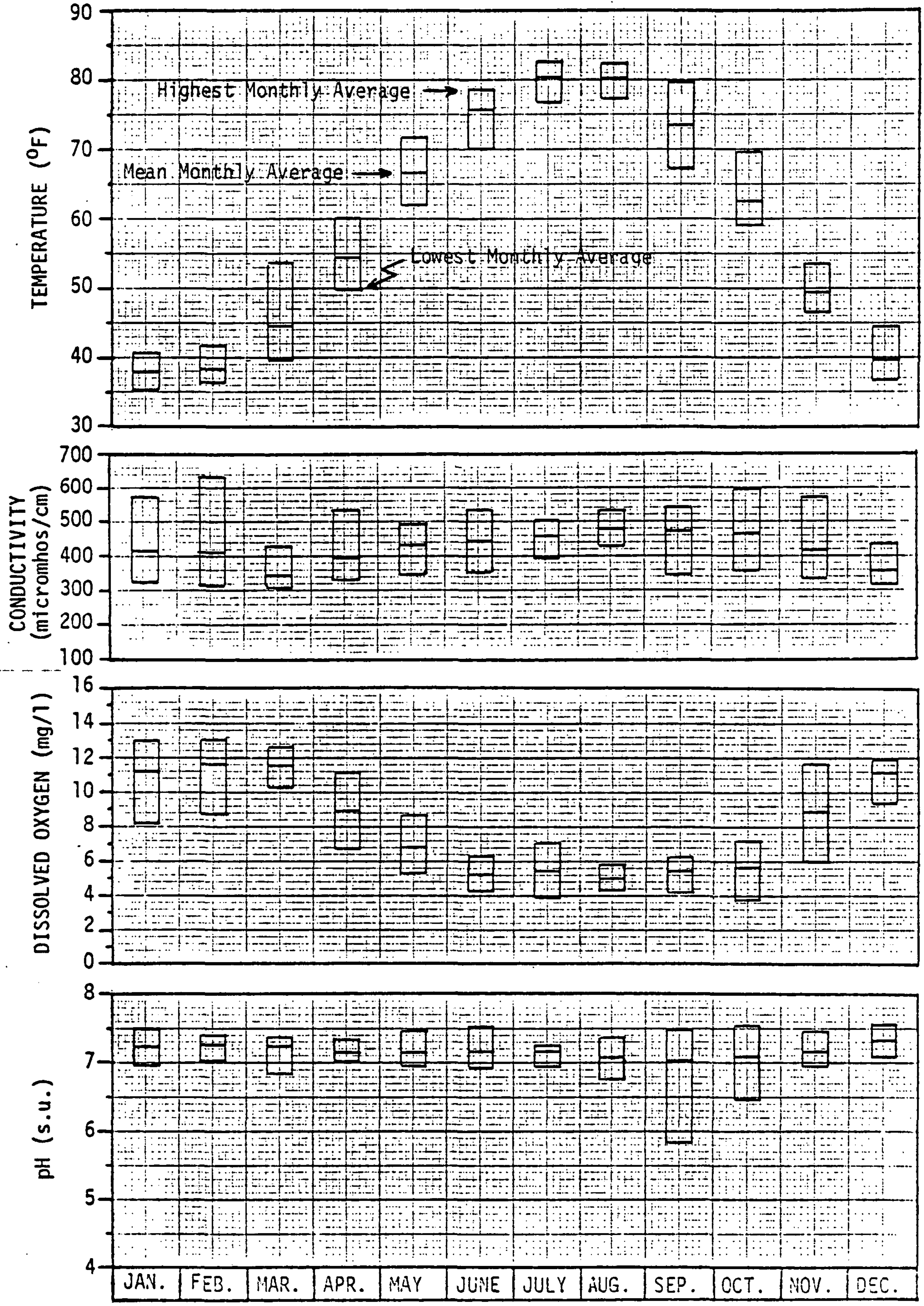


FIGURE 2.1.6.-32 SEASONAL VARIATION OF WATER QUALITY: MONTHLY AVERAGES - BEAVER RIVER AT BEAVER FALLS, 1970-7 After Source (6)

in Table 2.1.6.-29 (2). More detailed information for the 1975-1977 period at the two stations on the Ohio River and one on the Beaver River is presented in Table 2.1.6.-30, as obtained from EPA's STORET System. Similarly detailed information on water quality at the two ORSANCO stations in the basin is presented for 1977 in Table 2.1.6.-31 (39).

3. Water Quality Problems

The major water quality problems in the Ohio River Main Stem Basin are due to acid mine drainage, municipal sewage and industrial wastes. These problems and their specific causes are detailed for the streams affected in Table 2.1.6.-32 (1), (2), (25), (26). The COWAMP classification and the miles of streams degraded by the problems are also presented in the Table.

4. Compliance Status

Table 2.1.6.-33 compares the 1975 water quality at the WQN Stations in the basin with the 1974 State standards (1), (2), (25), (26).

Average dissolved oxygen levels were within standards at all stations but the minima were below the standard in the Ohio River and several other streams as well. Mean pH was unsatisfactory in Raccoon and Slippery Rock Creeks only, but many other streams were occasionally either were either lower or higher than the standard for the minimum or maximum pH. Temperature was a proble in the Beaver River and some of its tributaries. Most widespread violation of the standards was obtained for total iron and fecal coliform.

ORSANCO assessed the water quality of the Ohio River main stem and its major tributaries and compared the conditions during July 1, 1975 - June 30, 1976 with ORSANCO's stream quality criteria (or with ORBC's where ORSANCO criteria were not available) (37). Several parameters were found to violate the criteria as summarized in the table below. Parameters not

TABLE 2.1.6.-29

MEAN VALUES OF SELECTED PARAMETERS AT SAMPLING STATIONS IN THE OHIO RIVER MAIN STEM BASIN
(Data Collected from June 1962 to December 1974)

Source (2)

	River						
	Ohio River		Beaver River		Shenango River		Little Shenango River
	Sampling Station (PA-DER WQN No.)						
Parameter	901	902	904	905	909	910	913
pH (S.U.)	6.7	6.5	7.3	7.3	6.7	6.9	6.8
Dissolved Oxygen (mg/l)	9.8	8.9	8.8	8.2	8.2	12.5	10.8
Total Iron (ug/l)	2,463	2,262	1,288	1,832	2,176	814	916
Total Dissolved Solids (mg/l)	73	50	172	111	169	146	164
Temperature (^{o}C)	12.7	12.8	14.3	14.1	14.1	12.3	10.9
Turbidity (JTU)	19.3	16.3	16.8	16.9	17.6	14.3	10.2
Ammonia (mg/l N)	0.29	0.88	0.35	0.66	0.31	0.24	0.14
Total Phosphorus (mg/l P)	0.11	ND	0.22	0.20	0.23	0.09	0.05
Alkalinity (as $CaCO_3$) (mg/l)	25.2	13.1	57.2	57.8	51.7	53.9	77.4
Biochemical Oxygen Demand (mg/l)	2.8	1.9	4.4	8.5	3.8	2.4	2.0
Total Coliform (#/100 ml)	39,000	28,300	69,000	57,900	82,400	10,600	37,700

TABLE 2.1.6.-30 OHIO AND BEAVER RIVER WATER QUALITY, 1975-1977 (From EPA's STORET System)

Parameter	WQN Station No. 901 Ohio River at East Liverpool				WQN Station No. 902 Ohio River at Ambridge				WQN Station No. 905 Beaver River at Eastvale			
	No. of Samples	Mean Value	Maximum Value	Minimum Value	No. of Samples	Mean Value	Maximum Value	Minimum Value	No. of Samples	Mean Value	Maximum Value	Minimum Value
Water Temperature, ^{o}C	25	13.8	27.0	0.5	23	12.1	25.0	0.5	21	16.4	27.0	1.0
Flow, cfs	--	--	--	--	--	--	--	--	4	6,505	11,400	4,359
Turbidity, JTU	11	10.9	39.0	2.9	10	16.6	85.0	3.0	13	10.2	33.0	3.6
Conductivity at 25^{o}C, micromhos/cm	25	345	530	175	22	325	490	200	22	472	610	335
Dissolved Oxygen, mg/l	21	10.6	15.0	6.6	18	10.3	13.5	5.8	20	8.7	14.0	3.4
pH, Standard Units	24	7.1	7.6	6.8	21	7.1	7.8	6.3	22	7.4	8.6	6.8
Total Alkalinity, mg/l as $CaCO_3$	25	29	70	14	22	27	70	12	24	64	110	17
Mineral Acidity, mg/l	24	0	0	0	22	0	0	0	24	0	0	0
Acidity from CO_2, mg/l	25	0.16	4	0	22	0	0	0	23	0.52	12	0
Total Residue, mg/l	--	--	--	--	--	--	--	--	--	--	--	--
Dissolved/105^{o} Residue, mg/l	25	373	4,062	100	21	242	1,034	112	23	294	448	121
Total Nonfilterable Residue, mg/l	--	--	--	--	--	--	--	--	--	--	--	--
Settleable Residue, ml/l	--	--	--	--	--	--	--	--	--	--	--	--
Oil and Grease, mg/l	22	4.9	17.0	0.5	21	3.7	5.8	0.5	2	4.8	8.6	1.0
Total NH_3-N, mg/l	25	0.46	1.40	0.20	22	0.47	2.20	0.10	24	0.60	1.80	0.10
Total NO_2-N, mg/l	24	0.031	0.140	0.002	21	0.024	0.120	0.002	22	0.082	0.410	0.002
Total NO_3-N, mg/l	22	0.81	1.59	0.13	18	0.68	1.50	0.01	20	1.43	3.05	0.43
Total Phosphorus, mg/l P	25	0.13	0.25	0.03	21	0.14	0.34	0.03	23	0.20	0.66	0.09
Total Cyanide, mg/l	25	0.02	0.10	0.01	21	0.03	0.23	0.01	21	0.025	0.100	0.006
Total Hardness, mg/l as $CaCO_3$	26	112	180	30	22	104	157	60	24	164	225	115
Dissolved Calcium, mg/l	25	31.4	49.5	7.7	22	28.0	44.6	17.8	24	45.7	58.1	34.0
Dissolved Magnesium, mg/l	25	8	14	1	22	8.5	20.0	2.8	24	11.7	27.0	2.6
Chloride, mg/l	26	22	40	8	22	19.3	40.0	10.0	24	41	75	21
Total Sulfate, mg/l	25	101	440	36	22	118	680	48	24	92	295	50
Total Fluoride, mg/l	--	--	--	--	--	--	--	--	--	--	--	--
Total Arsenic, mg/l	3	0.043	0.100	0.010	2	0.010	0.010	0.010	3	0.040	0.100	0.010
Total Cadmium, mg/l	4	0.010	0.020	0.001	3	0.007	0.010	0.001	3	0.010	0.010	0.010
Total Chromium, mg/l	4	0.040	0.050	0.008	3	0.025	0.050	0.004	3	0.050	0.050	0.050
Total Copper, mg/l	4	0.040	0.050	0.010	3	0.022	0.050	0.006	3	0.037	0.050	0.010
Total Iron, mg/l	26	1.604	6.000	0.250	22	1.450	10.500	0.002	23	2.752	43.000	0.250
Total Lead, mg/l	4	0.058	0.100	0.010	3	0.060	0.100	0.030	3	0.053	0.100	0.010
Manganese, mg/l	5	0.380	0.800	0.160	4	0.895	2.400	0.260	3	0.200	0.300	0.100
Total Nickel, mg/l	4	0.043	0.050	0.020	3	0.040	0.050	0.020	3	0.050	0.050	0.050
Total Zinc, mg/l	4	0.040	0.060	0.010	3	0.050	0.070	0.030	3	0.093	0.180	0.050
Total Aluminum, mg/l	5	0.640	2.100	0.100	4	0.950	2.000	0.100	3	0.233	0.300	0.100
Total Coliforms, no./100 ml	--	--	--	--	--	--	--	--	--	--	--	--
Fecal Coliforms, no./100 ml	26	591	3,500	20	18	982	6,000	20	19	3,903	20,000	20
Total Phenols, mg/l	25	0.014	0.063	0.002	20	16.7	74.0	2.0	20	0.012	0.095	0.002
Total Mercury, mg/l	2	0.0008	0.0010	0.0005	2	0.0005	0.0005	0.0005	3	0.0007	0.0010	0.0005

TABLE 2.1.6.-31 OHIO AND BEAVER RIVER WATER QUALITY, 1977

Source (39)

	Parameter	Ohio River at South Heights				Beaver River at Beaver Falls			
		No. of Samples	Maximum Value	Minimum Value	Average Value	No. of Samples	Maximum Value	Minimum Value	Average Value
From Electronic Monitor	Arsenic, micrograms/liter	4	2	1		4	10	1	
	Barium " "	12	110	20		12	90	10	
	Cadmium " "	11	6	1		12	5	1	
	Chromium " "	12	24	4		12	16	4	
	Copper " "	12	24	8		12	112	6	
	Cyanide " "	35	70	10		36	60	10	
	Iron " "	12	6,500	400		12	4,500	650	
	Lead " "	12	35	3		12	50	10	
	Manganese " "	12	800	40		12	500	180	
	Mercury " "	12	0.5	0.5		12	0.5	0.5	
	Nickel " "	12	40	10		12	40	10	
	Phenol " "	35	63	2		36	40	2	
	Selenium " "	4	5	1		4	5	1	
	Silver " "	4	1	1		4	1	1	
	Zinc " "	12	210	20		12	170		
	Fecal Coliform, number/100 ml	31	213,000	150		31	20,000	50	
	Water Temperature, °F	Cont.	82.7		56.9	Cont.	86.2		57.9
	pH	Cont.	7.9	6.3		Cont.	8.2	6.6	
	Specific Conductance, micromhos/cm	Cont.	608		305	Cont.	949		436
	Sodium, mg/l	11	30	10	19	11	42	15	27
	Sulfate, mg/l	35	245	48	90	36	233	44	88
	Suspended Solids, mg/l	34	162	2	34	35	81	2	22
	5-Day BOD, mg/l	11	4.8	2.0	2.8	10	7.4	2.0	3.9
	Ammonia-N, mg/l	35	1.9	0.10	0.49	36	3.3	0.25	0.91
	Nitrate-N, mg/l	35	1.76	0.06	0.72	36	1.70	0.69	1.20
	Total Phosporus, mg/l	35	0.52	0.04	0.15	36	0.48	0.10	0.23
	Total Kjeldahl-N, mg/l	35	6.6	0.5	1.5	36	6.3	0.7	2.1
	Dissolved Oxygen, mg/l	Cont.		6.2	10.89	Cont.		2.2	7.17
	Dissolved Oxygen, % saturation	Cont.	128	62		Cont.	109	28	
From WUN*	Total Hardness, mg/l					104	218	102	154
	Non-Carbonate Hardness, mg/l					104	138	35	84
	Sulfate, mg/l					47	150	52	100
	Alkalinity, mg/l					365	97	36	70
	Chloride, mg/l					104	141	21	43
	Turbidity, standard units					365	320	6	20
	Threshold Odor Number, standard units					365	100	30	77

*Water Users' Network

TABLE 2.1.6.-32 CLASSIFICATION AND QUALITY PROBLEMS OF MAJOR STREAMS - OHIO RIVER MAIN STEM BASIN Sources (1), (2), (25), (26)

Stream	Stream Segment	CO-WAMP Sub-Basin	Class (a)	Category (b)	Problems	Causes of Problems (Parameter Group Violation) (c)	Miles of Stream Degraded By Problems
Pymatuning Lake	Shoreline	20A			Erosion and sedimentation	Sewer line construction (4)	11
Shenango River	Above Pymatuning Reservoir	20A	WQL	I	Phosphorus, taste and odor		20
	Below Pymatuning Reservoir	20A	WQL	I	Taste and odor, solids, Fe, oil, pH, fecal coliforms, CN, NH_3, phenol, DO, temperature	Combined sewers, industrial discharges, nonpoint sources (1, 2, 3, 4, 5)	
Mahoning River	State line to mouth	20B	WQL	I		Domestic & industrial wastes in Ohio	
Beaver River	Entire watershed	20B	WQL	I	Combined sewers, fecal coliforms, temperature, heavy metals, phenol, cyanides, oil and grease	Depressed water quality due to influx of Mahoning River which received substantial industrial waste discharges in Ohio. Organic loadings due to raw and inadequately treated sewage discharges (1, 2, 3, 4, 5)	10
Wallace Run		20B				Industrial waste and runoff (1, 4, 5)	2
Two Mile Run	Downstream from Westinghouse Industries	20B			Degradation in water quality and reduction of aquatic diversity and population downstream due to elevated heavy metal concentrations	Industrial waste (1, 4, 5)	2
Brady Run, South Branch	Watershed above Brady Run Dam	20B	WQL	I	Phosphorus		
Brady Run	Downstream from reservoir	20B			Siltation	Clay mine drainage (1, 4, 5)	2
North Fork Little Beaver Creek	Entire stream length	20B	EL	I	High dissolved solids, stream bed siltation	Runoff from extensive coal and fire clay strip mining operation in past. Moderate stripping still carried on (1, 4, 5)	1
Ohio River	Pittsburgh Point to state line	20B, G	WQL	I	Fecal coliform, oil, heavy metals	Combined sewers, industrial waste discharges, urban runoff, (1, 2, 3, 4, 5)	33
Thorn Creek		20C				Inadequately treated sewage and leachate from malfunctioning septic system in Penn Twp. and from Saxonburg STP (2, 3, 4)	2
Breakneck Creek		20C				The Mars STP is not providing tertiary treatment as required by the upgrade notice (2, 3, 4)	2

TABLE 2.1.6.-32 (Continued)

Stream	Stream Segment	CO-WAMP Sub-Basin	Class (a)	Category (b)	Problems	Causes of Problems (Parameter Group Violation) (c)	Miles of Stream Degraded By Problems
Little Connoquenessing Creek		20C			Fe, pH, sulfate	Localized problem due to mine drainage from tributaries (1, 4, 5)	2
Connoquenessing Creek	Entire watershed above Slippery Rock Creek	20C	WQL	I	BOD, NH_3, oil, suspended solids, heavy metals, sulfate	Industrial wastes, inadequately treated sewage (1, 2, 3, 4)	10
Muddy Creek	Entire watershed	20C	WQL	I	Phosphorus		
Brush Creek		20C				Mine drainage and inadequately treated sewage result in water quality problems under low flow conditions (2, 4)	1
Slippery Rock Creek	Entire watershed	20C	AMD	I	pH, iron, siltation, dissolved solids	Headwaters severely degraded by acid mine drainage due to extensive mining in Butler County area. Occasional siltation and increased suspended solids due to active limestone mining operations in vicinity of McConnel Mills Park (1, 4, 5)	7
Mulligan Run						Strip mining activities responsible for water quality degradation (1, 4, 5)	
Semiconan Run		20C					10
Yellow Creek							
Glade Run		20C	AMD	I		Sewage, acid mine drainage	
Wolf Creek	Entire watershed	20C	WQL	I	BOD, NH_3, phosphorus	Water treatment backwash sludge	
Cross Creek	Watershed including North Fork, from North Fork to Mouth	20D	AMD	I		Acid mine drainage	
Harmon Creek	Entire watershed	20D	AMD	I	Severely depressed	Acid mine drainage	
Little Raccoon Creek	Entire watershed	20D				Seepage from industrial waste disposal site. Runoff from coal refuse piles degrade one of the tributaries (1 4, 5)	6
Burgetts Fork	Reach between Slovan-Atlasburg and the stream mouth	20D			Severely degraded	Acid mine drainage, as well as raw and inadequately treated sewage discharges from the communities along the stream (1, 2, 3, 4, 5)	10
Raccoon Creek	Lower 40 miles						
Potatoe Garden Run	Entire watersheds	20D	AMD	I		Abandoned and active strip mines (1, 4, 5	63
Brush Run							
Dilloe Run							
Cross Creek							

TABLE 2.1.5.-32 (Continued)

Stream	Stream Segment	CO-WAMP Sub-Basin	Class (a)	Category (b)	Problems	Causes of Problems (Parameter Group Violation) (c)	Miles of Stream Degraded By Problems
Service Creek	Watershed above Service Creek Dam	20D	WQL	I	Phosphorus		
Traverse Creek	Watershed above State Park Dam	20D	WQL	I	Phosphorus		
Dutch Fork Buffalo Creek	Watershed above Dutch Fork Dam	20E	WQL	I	Phosphorus		
Wheeling Creek, North Fork	Watershed above Ryerson Station Dam	20E	WQL	I	Phosphorus		
Saw Mill Run	Entire watershed	20F	WQL	I		Water quality is adversely affected by acid mine drainage, illegal discharge from unsewered homes and storm water runoff, solid waste (1, 2, 3, 4, 5)	9.5
Chartiers Creek	Entire watershed above Allegheny-Washington County Line	20F	WQL	I	BOD, NH_3, combined sewers, fecal coliform, heavy metals	Middle reach between Washington and Cannonsburg affected by inadequately treated sewage discharges. Lower reach from Bridgeville to the mouth contains high concentrations of iron due to abandoned mine drainage. Industrial waste discharges in Washington area and urban runoff (1, 2, 3, 4, 5)	35
	Watershed from Allegheny-Washington County Line to mouth	20F	AMD	I	Oil, combined sewers, suspended solids, fecal coliform, heavy metals, dissolved oxygen		
Robinson Run	Entire watershed	20F	WQL	I	Poor quality	Raw and inadequately treated sewage; acid mine drainage (1, 2, 3, 4, 5)	16
Brush Run	Lower reach	20F	WQL	I		Inadequately treated sewage overflows (2, 3, 4)	1
Millers Run	Entire watershed	20F	WQL	I		Cecil and Mt. Pleasant Twp. areas affected by raw and inadequately treated sewage discharges. Lower reach affected by acid mine drainage and industrial wastes (1, 2, 3, 4, 5)	8
Ohio River, Tributaries of	Point to Big Sewickley Creek, except Chartiers Creek	20F, G	WQL	I	BOD, NH_3, suspended solids, oil, combined sewers		
Montour Run	Headwaters upstream from Imperial	20G	WQL	I		Raw and inadequately treated sewage and acid mine drainage from coal stripping operations (1, 2, 3, 4, 5)	5.5
Moon Run	Entire length	20G	WQL	I		Sewage, abandoned mine drainage (1, 4 5)	5
Big Sewickley Creek	Entire watershed	20G	WQL	I	Suspended solids, BOD, NH_3 heavy metals	Industrial wastes	

NOTES: (a) CLASSES: WQL - Water Quality Limited Stream
EL - Effluent Limited Stream
AMD - Acid Mine Drainage Affected Stream

(b) CATEGORIES: See definition in Section 2.1.6.4.

(c) PARAMETER GROUPS:
1 - Harmful substances (heavy metals, chemicals, pesticides, other toxins)
2 - Oxygen depletion
3 - Eutrophication potential (phosphorus, nitrogen)
4 - Physical modification (temperature, turbidity, suspended solids, color, flow)
5 - Salinity, acidity, alkalinity (conductivity, pH, alkalinity, total dissolved solids)

TABLE 2.1.6.-33 COMPLIANCE STATUS 1975 - OHIO RIVER MAIN STEM BASIN Sources (1), (2), (25), (26)

GENERAL INFORMATION								SPECIFIC WATER QUALITY PARAMETERS							POTENTIAL PROBLEMS						
Station No.	Stream	Class (a)	Category (b)	CO-WAMP Subbasin	County	Criter Stand. Group (c)	Average Flow cfs	pH S.U.	D.O. mg/l	TOT.Fe mg/l	TEMP. °C	TDS mg/l	ODOR S.U.	Total Colif. /100ml	ALL VALUES GIVEN AS mg/l					Overall Quality Rating	Will Stream Meet Water Quality Standards By 1983?
								mean/max.													
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
901	Ohio River	EL	I	20D	Beaver	B+h, k,l,q	10650	OK/ 5.4	OK	2.5/ 11.2	OK	OK	26/27	39000/ 366800	Phenol .030/ .300	Al OK/4.0	Zn .135/ .140	SO_4 OK/336	CN OK/40	Fair	No. Direct discharges expected to be corrected, but combined sewers in the Pittsburgh metropolitan area will still have adverse affects.
902	Ohio River	WQL	I	20G	Allegheny	B+h, k,l,q	35257	OK/ 5.3	OK/ 1.0	2.2/ 13.6	OK	OK	30/53	70100/ 804600	Phenol .040/ .190	Al 8.6/77	SO_4 OK/390	Mn OK/4.0		Fair to good	
903	Racoon Creek	EL	I	20D	Beaver	B	141	5.2/ 3.4-9	OK/ 3.5	5.5/ 20	OK	OK/ 1716		28300/ 297000	Al 16.5/84	Zn .180/ .180	Ni .480/ .480	SO_4 660/ 1900	Mn 4.6/7.4	Poor	No. Some cleanup is expected with use of funds previously allocated to Chartiers Creek.
904	Beaver River	EL	I	20B	Beaver	B+h,q	5551	OK/ 8.8	OK	OK/ 4.0	OK	OK	25/37	69200/ 390000	Phenol OK/.062	Zn .110/ .110				Poor	No. Sewage problem will be corrected; industrial waste problems may remain due to lack of control over discharges in Ohio.
905	Beaver River	EL	I	20B	Beaver	B+h,q	3259	OK/ 9.0	OK/ 3.6	1.8/ 18.0	OK/32	OK	28/34	57900/ 503300	Al 4.2/31	Pb .053/ .060	SO_4 OK/386				
906	Beaver River	EL	I	20B	Lawrence	B	1741	OK	OK/ 2.2	2.2/ 12.0	---	OK		57000/ 454000	Phenol .033/ .078						
907	Connoquenessing Creek	WQL	I	20C	Beaver	B	394	OK/ 8.8	OK	OK/ 9.1	OK	OK		30500/ 460000	Al 3.5/21	SO_4 OK/495				Poor	Yes.
908 (e)	Slippery Rock Creek	WQL	I	20C	Lawrence	A-b_1 +b_9	435	OK	OK/ 5.8	OK/ 6.0	OK/ 24	OK		10900/ 100000	Phenol .038/ .142					Good	No. Lack of funds for mine drainage projects.
909	Shenango River	EL	I	20A	Lawrence	B+h,q	6	OK	OK/ 3.0	2.2/ 7.4	OK	OK	28/35	82400/ 930000	Zn .114/ .130						Yes.

NOTES: (a) Classes: WQL = Water Quality Limited Stream
EL = Effluent Limited Stream
AMD = Acid Mine Drainage Affected Stream

(b) Categories: See definition in text, Section 2.1.6.4.
(c) 1974 Pa. Water Quality Criteria Groups and Levels as defined in Reference (28).
(d) Data Source: USGS Water Resources Bulletin No. 1.
(e) Discontinued.

TABLE 2.1.6.-33 (Continued)

GENERAL INFORMATION								SPECIFIC WATER QUALITY PARAMETERS							POTENTIAL PROBLEMS						
Station No.	Stream	Class (a)	Category (b)	CO-WAMP Subbasin	County	Criter Stand. Group (c)	Average Flow cfs	pH S.U.	D.O. mg/l	TOT.Fe mg/l	TEMP. oC	TDS mg/l	ODOR S.U.	Total Colif. /100ml	ALL VALUES GIVEN AS mg/l					Overall Quality Rating	Will Stream Meet Water Quality Standards By 1983?
								mean/max.													
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
910	Shenango River	EL	I	20A	Mercer	B+h, q	768	OK	OK	OK/ 3.4	OK	OK	39/45	10600/ 180000	SO_4 OK/425	Cu .107/ .194	Ni .166/ .306	Zn .085/ .129		Fair	Yes.
913	Little Shenango River	WQL	II	20A	Mercer	$C+v_1$	262	OK/ 5.8	OK	OK/ 10.5	OK	OK		37700/ 540000	Tot. Alk.as $CaCO_3$ OK/174						
914	Chartiers Creek	WQL	I	20F	Allegheny	$B-b_2 +b_5$	233	OK/ 4.4-10	OK/ 1.0	17.1/ 100	OK	OK/ 1500		55800/ 350000	Phenol .024/ .100	Al 15/.104	Zn .305/ .350	Ni .290/ .330	SO_4 305/ 350	Fair to poor	Not entirely. Approx. 18 miles in middle reach will meet standards by 1983; 17 miles in lower reach will violate standards due to mine drainage discharges and lack of funds for abatement and treatment, and difficulties in acquiring land on which to build acid drainage abatement facilities.
916	Chartiers Creek	WQL	I	20F	Washington	$B-b_2 +b_3$		OK	OK	OK/2.5	OK	OK			Zn .1[illegible]/ .120	SO_4 419/ 1450	Tot. Alk. 138/ 158				
915	Mahoning River	EL	I	20B	Lawrence	$B-d_2+d_5$,h, l,m,q		OK	OK/0	3.2/ 10.0	OK/33	OK	34/45		CN .027/ .145	Phenol .052/ .255	SO_4 OK/280	Mn OK/ 1.25	Zn 387/387	Poor	
917	Connoquenessing Creek	WQL	I	20C	Butler	B	23.8 (d)	OK	OK	OK/ 2.8	OK	OK			Zn .080/ .090	Ni .105/ .210	SO_4 OK/395			Depressed downstream from Butler, Eidenave, Zelienople; fair to good on remainder	Yes.

NOTES: (z) Classes: WQL = Water Quality Limited Stream
EL = Effluent Limited Stream
AMD = Acid Mine Drainage Affected Stream

(b) Categories: See definition in text, Section 2.1.6.4.
(c) 1974 Pa. Water Quality Criteria Groups and Levels as defined in Reference (28).
(d) Data Source: USGS Water Resources Bulletin No. 1.
(e) Discontinued.

TABLE 2.1.6.-33 (Continued)

GENERAL INFORMATION								SPECIFIC WATER QUALITY PARAMETERS							POTENTIAL PROBLEMS						
Station No.	Stream	Class (a)	Category (b)	CO-WAMP Sub-basin	County	Criter Stand. Group (c)	Average Flow cfs	pH S.U.	D.O. mg/l	TOT.Fe mg/l	TEMP. °C	TDS mg/l	ODOR S.U.	Total Colif. /100ml	ALL VALUES GIVEN AS mg/l					Overall Quality Rating	Will Stream Meet Water Quality Standards By 1983?
								mean/max.													
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
918	Two Mile Run	EL	I	20B	Beaver	B	---	OK	OK	OK/ 11.2	OK	OK			Zn .260/ .260						Yes.
919 (e)	Brush Creek	EL	I	20C	Beaver	B	481 (d)	OK	OK	1.7/ 5.6	OK	OK								Fair	Yes.
920	Glade Run	WQL	I	20C	Butler	B		OK	OK	OK/ 2.3	OK	OK			Zn .100/ .100					Good to excell-ent	
921	Slip-pery Rock Creek	WQL	I	20C	Butler	A-b_1, +b_9	20 (d)	OK	OK	OK/ 4.8	OK/23	OK		---						Good	No. Lack of funds for mine drain-age projects.
922	Slip-pery Rock Creek	WQL	I	20C	Law-rence	A-b_1, +b_9	564 (d)	8.6/ 8.6-8.7	OK	OK/ 1.8	25/25	OK			SO_4 OK/296						
923	North Fork Little Beaver Creek	EL	I	20B	Law-rence	A		OK	OK	OK/ 2.2	24/24	780/ 1132		65300/ 287500	SO_4 444/ 1652					Good	Yes.
924 (e)	Big Run	EL	I	20A	Law-rence	B	2 (d)														

NOTES: (a) Classes: WQL = Water Quality Limited Stream
EL = Effluent Limited Stream
AMD = Acid Mine Drainage Affected Stream

(b) Categories: See definition in text, Section 2.1.6.4.
(c) 1974 Pa. Water Quality Criteria Groups and Levels as defined in Reference (28).
(d) Data Source: USGS Water Resources Bulletin No. 1.
(e) Discontinued.

listed were either not sampled or were not violated at any time.

Parameter	% of Samples (or Time) which Violated ORSANCO's (or ORBC's) Stream Quality Criteria in 1975-1976	
	Ohio River at South Heights	Beaver River at Beaver Falls
Dissolved Oxygen	0	31
pH	3	0
Total Suspended Solids	8	3
Fecal Coliform		
for Recreation	100	100
for Water Supply	0	50
Total Phosphorus	38	100
Phenol	0	3
Cyanide	8	6
Total Iron	67	45

Due to drainage from abandoned mines in the basin, some effluent limitations have been postponed on Cross, North Fork Cross, and Harmon Creeks (35).

According to a recent report, over three-quarter of the stream length in the basin meets standards but, within the basin, four-fifth of the Connoquenessing-Slippery Rock Creek watershed and about half of the Ohio's main stem is satisfactory, while practically none of Chartiers Creek's main stem or Saw Mill Run is meeting standards (29).

DER estimates that with increasing municipal and industrial pollution control, most of the Ohio River probably will meet the standards by 1983 and many of the problems on the tributaries will be eliminated or reduced. Nevertheless, acid mine drainage, combined sewer overflow, urban runoff and other non-point sources will remain unabated in the near future (29).

5. Stream Quality Changes, 1973-1977

Table 2.1.6.-34 lists the length of improved stream miles and Table 2.1.6.-35 the length of degraded stream miles in the basin during the five-year period of 1973-77 (25).

A trend analysis was was performed for the major water quality parameters by comparing the 1953-75 (long-term) and the 1964-75 (short-term) data with the July 1, 1975 - June 30, 1976 data from ORSANCO's monitors. Available data in Pennsylvania allowed the short-term trend analysis only, the results of which are summarized below (37).

Parameter	Short-Term Trend	
	Ohio River at South Heights	Beaver River at Beaver Falls
Water Temperature	N.S.	N.S.
Dissolved Oxygen	Increasing (0.001)	N.S.
Total Coliform		Decreasing (0.001)
Threshold Odor		Increasing (0.001)
Turbidity		Decreasing (0.01)
pH	Increasing (0.001)	Increasing (0.05)
Alkalinity		Increasing (0.01)
Specific Conductance	N.S.	N.S.
Total Hardness		Decreasing (0.001)
Non-Carbonate Hardness		Decreasing (0.001)
Chloride		N.S.

N.S. = No statistically significant trend
(In parentheses): level of significance

TABLE 2.1.6.-34
STREAMS SHOWING WATER QUALITY IMPROVEMENTS (1973-1977)
OHIO RIVER BASIN
SOURCE (25)

YEAR	STREAM	COUNTY	LENGTH IMPROVED MILES	REASON FOR IMPROVEMENT
1973	Otter Creek	Mercer	0.5	Sewage treatment
	McCauley Run and Shenango River	Mercer	2	Improved industrial waste controls
	Shenango River	Lawrence	2.0	Improved industrial waste treatment
	Lardingtown Run	Butler	3	Strip mine reclamation
	Tributary to North Fork of Little Beaver Creek	Beaver	2	Improved industrial waste treatment
1974	Slippery Rock Creek	Lawrence	2	Improved sewage treatment
	Beaver River	Lawrence	5	Closing of industrial plant
	Shenango River	Mercer	2	Industrial discharge phased out
	Raccoon Creek	Beaver	12	Mine drainage abatement
1975	Ohio River	Allegheny and Beaver	40	Improved sewage treatment
	Chartiers Creek	Allegheny	1	Industrial waste discharge abated
	Millers Run	Allegheny	3	Sewage discharge abated
	Breakneck Creek	Butler	2	Improved sewage treatment
1976	Big Sewickley Creek	Allegheny & Beaver	0.5	Improved industrial waste treatment
	Montour Run	Allegheny	1	Sewer system connection
	Breakneck Creek	Butler	1	Industrial waste treatment
	Beaver River	Beaver	3.5	Improved sewage treatment
	Beaver River	Lawrence	0.25	Improved sewage treatment
	Ohio River	Beaver	4	Industrial waste treatment
	Walnut Bottom Run	Beaver	0.5	Sewer system connection
	Mill Run	Mercer	0.5	Sewage treatment
	Shenango River	Mercer	5	Sewage & industrial waste treatment

TABLE 2.1.6.-34 (Continued)

YEAR	STREAM	COUNTY	LENGTH IMPROVED MILES	REASON FOR IMPROVEMENT
1977	Chartiers Creek	Washington	4.0	Sewer connection to treatment facility
	Little Raccoon Creek	Washington	0.5	Treatment facility for refuse pile mine drainage
	Raccoon Creek	Beaver	40.0	Treatment facility & cleanup operation at industrial facility
	State Line Creek	Beaver	2.0	New treatment facility in Ohio-discharge in Penna. abated
	Connoquenessing Creek	Lawrence	1.0	Improved sewage treatment
	Wolf Creek	Mercer	1.0	Industrial waste treatment
	Unnamed Tributary of Munnelt Run	Mercer	3.0	Sewage treatment
	Unnamed Tributary of Squaw Run	Lawrence	1.0	Sewage treatment

TABLE 2.1.6.-35
STREAMS SHOWING WATER QUALITY DEGRADATION (1973-1977)
OHIO RIVER BASIN
SOURCE (25)

YEAR	STREAM	COUNTY	LENGTH DEGRADED MILES	REASON FOR DEGRADATION
1973	Little Beaver River	Lawrence	1.0	Industrial waste discharge
1976	Little Connoquenessing Creek	Butler	9	Mine drainage
	Semiconon Run	Butler	2	Mine drainage
	Chartiers Creek	Washington	1	Overloaded sewage treatment plant
	Brush Run (Chartiers Creek)	Washington	1	Overloaded sewage treatment plant
1977	Peggs Run	Beaver	1.5	Coal discharge stock piles & treatment plant
	Ohio River	Beaver	2.0	Discharge of fuel oil from storm sewer
	Pymatuning Lake	Crawford	11.0	Erosion & sedimentation problems due to sewer
	McClure Run	Lawrence	1.5	Spill of industrial waste
	Shenango River	Lawrence	15.0	Industrial waste discharge
	Unnamed Tributary to Neshannock Creek	Lawrence	0.5	Fish kill due to industrial waste spill

2.1.6.5. TREATMENT AND DISCHARGE OF WASTEWATERS

A. Municipal Wastewaters

Wastewater originates from residential, commercial and industrial water users and also from stormwater flows. Industrial and urban stormwaters contain a variety of potential pollutants but the major impact on the water quality is from pollutants present in residential and commercial sewage.

The existing Pennsylvania requirements governing wastewater treatment are contained in Chapter 95 of the Department of Environmental Resources "Rules and Regulations" (12). However, revisions were proposed in March 1978 (11) and although they have not been adopted the new formulation is probably a more accurate guide of requirements which will apply to the ORBES Region. Table 2.1.6.-36 sets forth the existing wastewater requirements and Table 2.1.6.-37 outlines the proposed revisions. The revisions are more stringent. They place responsibility for justifying any exception to the protection of high quality waters on the discharger. Also, any new development discharging into high quality waters would need to utilize best available, rather than best practicable, technology. A new section on waste load allocations provides the department greater flexibility to address the problems of (a) non-attainment of quality criteria in some stream sections, and (b) the lack of knowledge of the impact of some pollutants. Similarly the concept of land disposal has received emphasis which was absent in the preceding regulations.

Primary, secondary and tertiary treatment levels are mentioned extensively with reference to wastewater treatment. The Department of Environmental Resources actually established eight treatment level classifications which are defined in terms of the expected effluent concentrations of the most important water parameters (2). Table 2.1.6.-38 lists the eight treatment levels and the expected concentration of the four water parameters corresponding to them. Colifrom bacteria are maintained at low concentrations by

TABLE 2.1.6.-36

EXISTING WASTE WATER TREATMENT REQUIREMENTS
Source (12), (40)

TITLE 25. RULES AND REGULATIONS
PART I. DEPARTMENT OF ENVIRONMENTAL RESOURCES
Subpart C. PROTECTION OF NATURAL RESOURCES
ARTICLE II. WATER RESOURCES

CHAPTER 95. WASTE WATER TREATMENT REQUIREMENTS

Authority

The provisions of this Chapter 95 issued under act of June 22, 1937, P.L. 1987, § 5 (35 P.S. § 691.5.).

Source

The provisions of this Chapter 95 adopted June 1977.

§ 95.1 General requirements.

(a) Specific treatment requirements and effluent limitations for each waste discharge shall be established based on the most stringent of subsection (b) of this section, the water quality criteria specified in Chapter 93 of this title (relating to water quality criteria), the applicable treatment requirements and effluent limitations to which a discharge is subject under the Federal Water Pollution Control Act, as amended (33 U.S.C. §§ 1251 et seq.) or the treatment requirements and effluent limitations of this title.

(b) Waters having a better quality than applicable water quality criteria as of the effective date of the establishment of such criteria shall be maintained at such high quality unless it is affirmatively demonstrated that a change is justified as a result of necessary economic or social development and will not preclude uses presently possible in such waters.

(c) Any industrial, public or private project or development which would constitute a new source of pollution or an increased source of pollution to high quality waters shall be required to provide the highest and best practicable means of waste treatment to maintain high water quality.

(d) In implementing the provisions of subsection (b) and (c) of this section, the Department shall keep the Administrator of the Environmental Protection Agency advised and shall provide him with such information as he will need to discharge his responsibilities under the Federal Water Pollution Control Act (33 U.S.C. 1151 et seq.).

TABLE 2.1.6.-36 (Continued)

§ 95.2 Waste treatment requirements.

(a) All wastes shall be given a minimum of secondary treatment.

(b) Secondary treatment for sewage, except discharges from the bodies of animals, is that treatment which shall accomplish the following:

(1) Reduce the organic waste load as measured by the biochemical oxygen demand test by at least 85% during the period May 1 to October 31, and by at least 75% during the remainder of the year based on a five consecutive day average of values.

(2) Remove practically all of the suspended solids.

(3) Provide effective disinfection to control disease producing organisms.

(4) Provide satisfactory disposal of sludge.

(5) Reduce the quantities of oils, greases, acids, alkalis, toxic, taste and odor producing substances, color and other substances inimical to the public interest to levels which shall not pollute the receiving stream.

(c) Secondary treatment for other wastes is that treatment which achieves either of the following:

(1) The effluent limitations resulting from the application of the "best practicable control technology currently available" as defined by the Administrator of the United States Environmental Protection Agency pursuant to Sections 301, 304, and 402 of the Federal Water Pollution Control Act (33 U.S.C. §§ 1311, 1314, and 1342); or

(2) For those discharges for which "best practicable control technology currently available" has not been defined by the Administrator under the Federal Water Pollution Control Act (33 U.S.C. §§ 1251 et seq.), effluent limitations resulting from the Department of Environment Resources' determination of the equivalent of "best practicable control technology currently available".

TABLE 2.1.6.-36 (Continued)

§ 95.3 Reserved.

§ 95.4. Discharge to acid stream.

(a) Where wastes are discharged to a stream polluted by coal mine drainage from abandoned mines to the extent that all the alkalinity of the stream has been exhausted and the pH of the stream is 4.0 or less at practically all times at the point of discharge and throughout the stream, a minimum of primary treatment or its equivalent for industrial wastes shall be provided to bio-degradable wastes.

(b) A minimum of secondary treatment shall be required on such streams where:

(1) the quality of the water in the receiving stream is expected to improve significantly due to a scheduled program for abatement of pollution from abandoned mines; or

(2) the primary treated effluent would cause pollution in downstream waters.

(c) Primary treatment is that treatment which shall accomplish the following:

(1) Remove practically all the settleable solids.

(2) Remove at least 35% of the organic pollution load as measured by the biochemical oxygen demand test.

(3) Provide effective disinfection to control disease producing organisms.

(4) Provide satisfactory disposal of sludge.

(5) Reduce the quantities of oils, greases, acids, alkalis, toxic-, taste-, and odor-producing substances, color and other substances inimical to the public interest to levels that will not pollute the receiving stream.

§ 95.5. **Effective disinfection.**

Effective disinfection to control disease producing organisms shall be the production of an effluent which will contain a concentration not greater than 200/100 ml of fecal coliform organisms as a geometric average value nor greater than 1,000/100 ml of these organisms in more than 10% of the samples tested.

§ 95.6. **Change in treatment requirements.**

(a) Whenever there is a change in the provisions of Chapter 93 (relating to water quality criteria) or this Chapter or whenever the department adopts a plan or makes a determination that would change existing or impose additional water quality criteria or treatment requirements, it shall be the duty of the permittee of facilities affected thereby, upon notice from the department, to promptly take such steps as shall be necessary to plan, obtain a permit or other approval, and construct such facilities as may be required to comply with the new water quality criteria or treatment requirements.

(b) Within ninety (90) days of the receipt of such notice, or within such lesser period as the department may specify, the permittee shall submit to the department either a report establishing that its existing facilities are capable of meeting the new water quality criteria or treatment requirements or a schedule setting forth the nature and date of completion of steps that shall be necessary to plan, obtain a permit or other approval, and construct facilities to comply with the new water quality or treatment requirements. The permittee shall comply with the schedule as approved by the department.

TABLE 2.1.6.-37 PROPOSED REVISIONS TO WASTE WATER TREATMENT REQUIREMENTS AS OF MARCH 1978 Source (11)

Material proposed to be added to an existing rule or regulation is printed in **bold face** and material proposed to be deleted from such a rule or regulation is enclosed in brackets **[—]** and printed in **bold face**. Proposed new or additional regulations are printed in standard type face.

Chapter 95. Wastewater Treatment Requirements

§ 95.1. General Requirements.

(a) Specific treatment requirements and effluent limitations for each waste discharge shall be established based on the more stringent of subsections (b) and (c) of this section, the water quality criteria specified in Chapter 93 of this title (relating to water quality **[~~criteria~~]** **standards**), the applicable treatment requirements and effluent limitations to which a discharge is subject under the Federal Water Pollution Control Act, as amended (33 U.S.C. §§ 1251 *et seq.*) or the treatment requirements and effluent limitations of this title [.]; **and such treatment requirements and effluent limitations shall be incorporated by the Department into permits and orders issued under The Clean Streams Law (35 P. S. §§ 691.1-691.1001) and into certifications issued under the Federal Water Pollution Control Act.**

(b) Waters having **[~~a better water quality than the applicable water quality criteria as of the effective date of establishment of such criteria~~]** **a water use designated as "High Quality Waters" in § 93.9(b) of this title (relating to designated water uses and water quality criteria)** shall be maintained and protected at **[~~such high quality~~]** **their existing quality**, unless **[~~it is~~]** **the following are** affirmatively demonstrated **[~~that a change is justified as a result of necessary economic or social development and will not preclude uses presently possible in such waters.~~]** **by a proposed discharger of sewage, industrial wastes, or other pollutants:**

(1) the proposed new, additional, or increased discharge or discharges of pollutants is justified as a result of necessary economic or social development which is of significant public value; and

(2) such proposed discharge or discharges, alone or in combination with any other anticipated discharges of pollutants to such waters, will not preclude any use presently possible in such waters and downstream from such waters and will not result in a violation of any of the numerical water quality criteria specified in § 93.9 (b) of this title for such waters or for any other of the waters of this Commonwealth.

(c) **[~~Any industrial, public or private project or development which would constitute a new source of pollution or an increased source of pollution to high quality waters shall be required to provide the highest and best practicable means of waste treatment to maintain high quality.~~]** **Waters having a water use designated as "Exceptional Value Waters" in § 93.9(b) of this title (relating to designated water uses and water quality criteria) shall be maintained and protected at a minimum at their existing quality.**

(d) **[~~In implementing the provisions of subsections (b) and (c) of this Section, the Department shall keep the Administration of the Environmental Protection Agency advised and shall provide him with such information as he will need to discharge his responsibilities under the Federal Water Pollution Control Act (33 U.S.C. § 1151 et seq.).~~]** **Any project or development which would result in a new, additional, or increased discharge or discharges of sewage, industrial wastes, or other pollutants into waters having a water use designated as "High Quality Waters" in § 93.9(b) of this title (relating to water quality criteria) shall be permitted only in compliance with the requirements of subsection (b) of this section and, furthermore, shall be required to do either of the following:**

(1) utilize the best available combination of treatment and land disposal technologies and practices for such wastes where such land disposal would be economically feasible, environmentally sound, and consistent with all other regulations in this title,

(2) if such land disposal is not economically feasible, is not environmentally sound, or cannot be accomplished consistent with all other regulations of this title, utilize the best available technologies and practices for the reuse and discharges of such wastes.

§ 95.3. [Reserved] Waste load allocations.

(a) Waste load allocations are specific daily limits on the discharge of wastes from point sources as opposed to requirements of minimum waste treatment performance as specified elsewhere in this title.

(b) Waste load allocations are an administrative device to allow the Department to determine effluent limitations necessary to protect water quality and to treat waste dischargers equitably and will normally be implemented by their inclusion as effluent limitations in permits, orders, NPDES permit certifications, or similar Departmental actions concerning point source discharges.

(c) Waste load allocations do not establish a transferable property right: that is, the discharger cannot transfer his allocation to another discharger. The Department may transfer a waste load allocation when a permit is transferred provided that no violations of this title exist.

(d) Waste load allocations will be made by the Department when the following conditions prevail:

(1) Water quality criteria for stream section, segment, or zone are not being achieved, even though discharges to such section, segment, or zone are being treated to meet the minimum treatment requirements specified in Chapters 93, 95 and 97 of this title or the Federal Water Pollution Control Act, 33 U.S.C.A. §§ 1251-1276.

(2) Water quality criteria for a stream section, segment, or zone may not be achieved during periods of accepted design stream flow, as identified in § 93.5(b) of this title (relating to designated water uses specific water quality criteria), even if existing or anticipated discharges to such section, segment, or zone were treated to meet the minimum treatment requirements specified elsewhere in this title.

(3) Minimum treatment requirements have not been established for a particular pollutant.

(e) In making a waste load allocation, the Department will determine the stream section, segment, or zone and the pollutant for which a waste load allocation is needed. The Department will also determine the maximum allowable daily load ("MDL") of the pollutant from point and nonpoint sources which the receiving waters can assimilate at the accepted design stream flow without endangering the achievement of water quality criteria or water uses.

(f) In determining the MDL, the Department will do the following:

(1) Determine whether the pollutant in question is a persistent or nonpersistent-decaying-substance. The Department will treat all pollutants as persistent unless it finds, on the basis of information available to it, that the substance is nonpersistent.

(i) For persistent substances, the MDL shall be calculated on the basis that instream concentrations of the substance are determined solely by dilution in the receiving waters.

(ii) For nonpersistent substances, the Department will determine and specify, in writing, the mechanism by which the substance decays in the stream, including mathematical equations or formulae used to describe such instream decay.

(2) Provide a margin of safety which takes into account:

(i) any lack of knowledge concerning the relationship between effluent limitations and water quality including any uncertainty or imprecision in mathematical models utilized to determine this relationship; and

(ii) in the case of a nonpersistent substance, any imprecision or uncertainty concerning the mechanism by which the substance decays in the stream.

(3) Determine what portion of the MDL shall be attributed to nonpoint sources and what portion to point sources. In making this determination, the Department will consider a specific allowance for anticipated economic and population growth over a period of at least ten years.

(g) The portion of the MDL which is determined to be attributable to point sources shall be the maximum daily allowable load ("MAL") and shall be equitably allocated among existing and proposed point source discharges in the form of effluent limitations specifying maximum daily quantities of the pollutant in question that may be discharged from each such point source, subject, however, to the following:

(1) A portion, not less than 10%, of the MAL shall be reserved as an allowance for anticipated economic and population growth over at least a five-year period, including an additional allowance reflecting the precision and validity of the method used to estimate such population and economic growth.

(2) The pollutant loadings allocated to individual point sources are compatible with achieving and maintaining water quality criteria and protecting existing or possible beneficial uses at each discharge point.

(3) The Department may specify daily average quantity effluent limitations, as well as average and maximum concentration limitations, in addition to any daily maximum quantity limitation allocated to a particular point source.

(h) Whenever a mathematical modeling technique is utilized to determine the MDL or to describe instream decay of a nonconservative substance, the modelling technique selected should represent the minimum level of sophistication and complexity needed to provide for waste load allocations.

(i) The Department will revise the waste load allocation for a stream segment using the procedures described in this section if the Department determines that the reserve specified in subsection (g) (1) of this section will be exhausted or whenever it deems it necessary to do so. Allocations not used will be returned to the reserve.

(j) Whenever a permit, order, certification, or other Departmental action specifies an effluent limitation for a particular point source which is based on a waste load allocation, the Department may also require appropriate monitoring of the receiving waters and reporting of such monitoring data to the Department unless the Department makes a specific finding that such monitoring would be redundant.

(k) The Department may request any present or potential dischargers of any pollutant for which a waste load allocation is being made under this section to supply information concerning any of the factors specified in this section as well as any waste load allocation model or formula such discharger may have developed for waste load allocation. If the discharger fails to submit the requested information within 30 days or such longer period as the Department may specify in writing, such discharger shall be deemed to have waived its right to contest in any forum, the factors, formulae, and models used by the Department in the waste load allocation.

(l) Where the Department determines that the procedures specified in this section are inappropriate for making a waste load allocation for a particular stream segment, it may adopt a revised method of waste load allocation for that segment, provided it publishes the substance of such proposed revised method in the Pennsylvania Bulletin and solicits comments thereon.

§ 95.4. Location of waste discharges.

(a) Wastewater discharge effluent limitations relating to the water quality criteria of Chapter 93 of this title (relating to water quality standards) shall be established so as to attain and maintain those criteria and shall be calculated upon the assumption of complete mixing of the discharge effluent with the receiving waters at the point of discharge, based upon an allocated portion of the design stream flow.

(b) Wastewater discharge effluent limitations described in subsection (a) of this section shall be determined as follows:

(1) They shall be established so as to provide for the maintenance and propagation of a balanced community of aquatic life, animal life, and waterfowl in and on the receiving waters, and so as to prevent pollution as defined in section 1 of the Clean Streams Law (35 P. S. § 691.1).

(2) They shall be calculated, at a minimum, so as to insure that the discharge will at no time cause the applicable water quality criteria to be violated in areas described as follows:

(i) Outside an area greater than ½ the width, or more than ⅓ the vertical cross-sectional area of the receiving waters at the point of discharge.

(ii) Outside an area, in any direction from the point of discharge, equal to 10% of the surface of any receiving reservoir or inland lake except Lake Erie, where the area shall not exceed 12 acres:

(iii) In any hypolimnetic waters of any inland lake or reservoir, waters which serve as a migratory route for any species of aquatic life, waters contributing to a drinking water supply intake; or any waters within a bathing place permitted pursuant to the Public Bathing Law, (35 P. S. §§ 672-680d).

(iv) In waters which constitute or interface with the spawning areas of aquatic life.

(3) They shall, at no time, allow for a change in the temperature of the receiving waters at any point by more than 2°F. in any one-hour period or result in mortality of any indigenous fish species.

(c) The phrase, "allocated portion of the design stream flow," shall be defined, for purposes of this section, as that portion of the accepted design stream flow, as set forth in § 93.5 of this title (relating to application of water quality criteria to discharge of pollutants), of the receiving waters which is selected by the Department for use in calculating water quality criteria-related effluent limitations; provided that no portion shall be allocated to more than one discharge.

§ [~~95.4~~] 95.5. Discharge to acid stream.

* * * * *

§ 95.6. Discharge to lakes, ponds, and impoundments.

(a) Except where otherwise specified in the Department's waste-water management implementation plans, new discharges or expanded or upgraded existing discharges to watersheds and their tributaries that flow into lakes, ponds, and reservoirs more than 25 acres in surface area or more than 15 feet maximum depth, or both, and that have 30 days or more detention time based on average daily flow shall be treated or otherwise abated to remove phosphorus such that the total phosphorus in the discharge does not exceed 0.5 mg/l as P. The Department will determine, on a case-by-case basis, the proximity to the lake, pond, or reservoir that shall require these special phosphorus controls.

(b) Land disposal of wastes should be utilized wherever feasible to prevent the discharge of nutrients into lakes, ponds, or reservoirs.

§ [~~95.5~~] 95.7. Effective disinfection.

* * * * *

§ [~~95.6~~] 95.8. Change in treatment requirements.

(a) If there is a change in the provisions of Chapter 93 (relating to water quality [~~criteria~~] **standards**) or this Chapter or whenever the Department adopts a plan or makes a determination that would change existing or impose additional water quality criteria or treatment requirements, it shall be the duty of the permittee of facilities affected thereby, upon notice from the Department, to promptly take steps as shall be necessary to plan, obtain a permit or other approval, and construct such facilities as may be required to comply with the new water quality [~~criteria~~] **standards** or treatment requirements.

(b) Within 90 days of the receipt of such notice [.] or within such lesser period as the Department may specify, the permittee shall submit to the Department either a report establishing that its existing facilities are capable of meeting the new water quality [~~criteria~~] **standards** or treatment requirements or a schedule setting forth the nature and date of completion of steps that shall be necessary to plan, obtain a permit or other approval, and construct facilities to comply with the new water quality or treatment requirements. The permittee shall comply with the schedule as approved by the Department.

TABLE 2.1.6.-38

TREATMENT LEVELS AND THEIR CORRESPONDING EXPECTED EFFLUENT CONCENTRATIONS

Source (2)*

Treatment Level Classification	Parameter (mg/l)											
	BOD			NH_3-N			TOT P			TSS		
	30 day avg.	7 day avg.	daily max.	30 day avg.	7 day avg.	daily max.	30 day avg.	7 day avg.	daily max.	30 day avg.	7 day avg.	daily max.
(1) No treatment (2) Less than Primary (3) Primary (4) Intermediate	No effluent concentrations have been designated for these four treatment levels.											
(5) Secondary	30	45	60	-	-	-	-	-	-	30	45	60
(6) Secondary & High BOD + NH_3 Removal	10-30	10-30	20-60	1.5-9.0	1.5-9.0	3-18	-	-	-	25-30	25-30	50-60
(7) Tertiary	10	10	20	1.5-9.0	1.5-9.0	3-18	0.5-1.0	0.5-1.0	1-2	25	25	50
(8) Tertiary & Other	<10	<10	<10	<1.5	<1.5	<3	<0.5	<0.5	<1	<25	<25	<50

*Original source: DER Bureau of Water Quality Management, Pittsburgh Regional Office

BOD - Biochemical Oxygen Demand
NH_3-N - Ammonia Nitrogen
TOT P - Total Phosphorus
TSS - Total Suspended Solids

chlorination in combination with the various treatment levels.

The bulk of the population in the ORBES Region is served by municipal wastewater facilities and some are served by non-municipal facilities such as septic tanks. Inventories of the municipal facilities are available in Chapter VII, Appendix A, Study Areas #8, and #9, of the COWAMP study for Pennsylvania (1), (2). Maps showing the location of the facilities are available in the COWAMP reports for Areas #8, #9, #5, and #6 {(1), (2), (3), and (4)}. (The overlap of the COWAMP Study Areas with the ORBES Region was described in Section 2.1.6.1.)

The municipal facilities' inventories in COWAMP list the facilities individually and tabulate the location, facility owner, population served (design and actual), wastewater flow (design and actual), treatment provided, and the name, condition, and classification of the receiving stream. Additional relevant data (e.g. wastewater characteristics) are listed in a separate table for the major facilities. A summary of municipal facilities in COWAMP Study Areas #8 and #9 is presented in Table 2.1.6.-39. This groups the number of facilities, population served and level of treatment provided by county. Table 2.1.6.-40 gives a similar summary for non-municipal facilities. These include treatment such as septic tanks, Imhoff tanks, stabilization ponds, extended aeration, activated sludge, and sand filtration. Five non-municipal facilities in COWAMP Area #9 have flows that exceed 0.25 million gallons per day and they comprise 25% of the area's non-municipal flow. In Area #8, non-municipal facilities serve less than half the population that is so served in Area #9. In addition, four of the counties in Area #8 do not belong to the ORBES Region.

The volume of wastewater discharged to a receiving stream is an important aspect of the water quality of rivers. The heaviest concentration of wastewater treatment plants occurs, as one would expect, in urban areas and the

TABLE 2.1.6.-39

MUNICIPAL FACILITIES SUMMARY: COWAMP AREA #8

Source (1)

County	No. Facilities*	Actual Pop. Served	Treatment Provided*							
			Primary		Secondary		Tertiary		Other	
			No. Facilities	Population Served	No. Facilities	Population Served	No. Facilities	Population Served	No. Facilities	Population Served
Clarion	9	18,000	1	350	6	15,200	0	0	1(L),1(R)	2,450
Crawford**	10	47,000	1	8,000	8	35,600	0	0	1(R)	3,000
Elk	3	22,000	0	0	3	22,000	0	0	-	0
Forest	2	3,000	0	0	0	3,000	0	0	2(R)	0
Jefferson	7	27,000	2	6,000	4	19,800	0	0	1(R)	1,200
Lawrence	7	79,000	3	9,000	4	70,000	0	0	-	0
McKean**	9	41,000	0	0	6	39,000	0	0	2(L),1(R)	2,000
Mercer	13	89,000	3	24,500	9	64,000	0	0	1(R)	500
Potter**	3	6,000	0	0	2	5,000	0	0	1(R)	1,000
Venango	7	42,000	3	19,000	4	23,000	0	0	-	0
Warren**	4	22,000	0	0	4	22,000	0	0	-	0
Total	74	396,000	13	66,850	50	318,600	0		8(R),3(L)	10,150
% of Total	100	-	18	17%	67	81%	0		11(R),4(L)	2%

(R) - Raw
(L) - Lagoons

* Assuming that all proposed treatment facilities currently have raw discharges due to either population concentrations or non-municipal facilities malfunctions.

** Crawford, McKean, Potter and Warren Counties are not in the ORBES Region.

TABLE 2.1.6.-39 (Continued)

MUNICIPAL FACILITIES SUMMARY: COWAMP AREA #9

Source (2)

County	Number of Facilities(a)	Actual Population Served	Treatment Provided							
			Primary		Secondary		Tertiary		Other (c)	
			# of Facilities	Population Served	# of Facilities	Population Served	# of Facilities	Population Served	# of Facilities	Population Served
Allegheny	96	1,760,000	8	182,000	75	1,560,000	10	4,000	3(L) 7(R)	2,000 12,000
Armstrong	4	25,000	2	7,500	2	7,500	0	-	6(R)	10,000
Beaver	25	168,000	4	54,600	19	110,400	2	2,000	2(R)	1,000
Butler	14	73,000	0	-	12	72,300	0	-	2(L) 9(R)	700 -
Fayette	22	146,000	3	19,000	18	69,300	1	200	25(R)	57,500
Greene	8	14,000	4	4,000	4	7,000	0	-	5(R)	3,000
Indiana	4	39,000	1	5,226	3	29,133	0	-	6(R)	4,641
Washington	22	186,000	2	27,900	18	135,408	2	558	12(R)	22,134
Westmoreland	47	297,000	3	64,746	28	136,026	15	53,460	1(L) 31(R)	1,485 41,283
Total	242	2,708,000	27	364,972	179	2,127,067	30	60,218	6(L) 103(R)	4,185 151,558
% of Total (b)	54%	94%(d)	6%	13.5%	40%	78.5%	7%	2.2%	1%(L) 46%(R)	0.2% 56.0%

(a) These numbers do not include raw discharges.
(b) These numbers include raw discharges (i.e. (R) + No Facilities = Total)
(c) (R) = Raw, (L) = Lagoons
(d) Based on 1970 population of 2,875,000 [p. V-6]

TABLE 2.1.6.-40

NON-MUNICIPAL FACILITIES SUMMARY: COWAMP AREA #8

Source (1)

County	No. Facilities	Actual Pop. Served	Treatment Provided: Septic Tank No. Facilities	Septic Tank Pop. Served	Septic Tank/Sand Filtration No. Facilities	Septic Tank/Sand Filtration Pop. Served	Stabilization Pond No. Facilities	Stabilization Pond Pop. Served	Extended Aeration No. Facilities	Extended Aeration Pop. Served	Extended Aeration/Advanced Treatment* No. Facilities	Extended Aeration/Advanced Treatment* Pop. Served	Other No. Facilities	Other Pop. Served
Clarion	19	4,800	0	0	4	560	5	1,110	9	3,080	0	0	1(a)	50
Crawford**	36	25,700	0	0	4	240	4	650	15	17,100	10	6,750	2(b),1(g)	960
Elk	4	1,100	0	0	0	0	0	0	4	1,100	0	0	0	0
Forest	5	7,300	0	0	1	100	1	300	2	6,500	1	400	0	0
Jefferson	6	6,400	0	0	4	5,100	0	0	2	1,300	0	0	0	0
Lawrence	36	13,300	1	900	5	1,915	7	765	13	4,940	6	1,980	1(b),1(c), 1(d),1(g)	2,800
McKean**	4	1,400	0	0	0	0	0	0	4	1,400	0	0	0	0
Mercer	58	28,400	0	0	12	2,500	18	11,200	15	4,600	10	6,940	1(b),1(g), 1(h)	3,160
Potter**	7	2,300	0	0	1	10	1	50	4	940	1	1,300	0	0
Venango	29	13,800	0	0	6	775	5	1,100	9	4,050	3	3,000	1(b),1(d), 1(e),1(i), 2(g)	4,875
Warren**	26	10,300	1	~260	12	1,600	0	0	9	3,800	2	1,100	1(b),1(f)	3,800
Total	230	114,800	2	1,160	49	12,800	41	15,175	86	48,810	33	21,470	19	15,645
% of Total	100%	-	1%	1%	21%	11%	18%	13%	38%	42%	14%	19%	8%	14%

* Advanced Treatment is defined as microstraining, sand filtration, or stabilization ponds.

(a) no information
(b) trickling filter
(c) contact stabilization
(d) no treatment
(e) stabilization pond/polishing pond
(f) septic tank/sand filtration & advanced treatment
(g) extended aeration/polishing pond
(h) sand filtration & advanced treatment
(i) stabilization pond/sand filtration

**Crawford, McKean, Potter and Warren Counties are not in the ORBES Region.

TABLE 2.1.6.-40 (Continued)

NON-MUNICIPAL FACILITIES SUMMARY: COWAMP AREA #9

Source (2)

County	Number of Facilities	Actual Population Served	Treatment Provided: Septic Tank/ Imhoff Tank		Imhoff Tank or Advanced Treatment		Stabilization Pond		Extended Aeration		Extended Aeration Advanced Treatment*		Imhoff Tank/ Trickling Filter		Activated Sludge		Sand Filtration		Other	
			# of Fac.	Pop. Served	# of Fac.	Pop. Served	# of Fac.	Pop. Served	# of Fac.	Pop. Served	# of Fac.	Pop. Served	# of Fac.	Pop. Served	# of Fac	Pop. Served	# of Fac.	Pop. Served	#of Fac.	Pop. Served
Allegheny	80	49,100	4	5,175	17	3,617	0	-	32	12,798	14	6,212	6	6,470	0	-	1	1,200	2(b) 1(j) 2(c) 1(g)	13,628
Armstrong	23	9,200	0	-	1	74	0	-	11	5,140	7	2,940	0	-	2	276	0	-	2(c)	770
Beaver	38	19,400	0	-	3	155	2	349	23	8,168	4	4,38[illegible]	0	-	2	2,910	1	97	1(a) 1(g) 1(b)	3,337
Butler	59	44,400	0	-	7	710	9	1,776	25	10,434	13	4,795	1	266	0	-	0	-	1(d) 1(c) 1(b) 1(l)	26,419
Fayette	54	26,600	1	1,000	14	2,240	0	-	28	17,522	7	5,116	1	335	0	-	0	-	1(a) 2(c)	387
Greene	27	10,300	2	1,112	4	1,947	0	-	9	4,532	6	2,225	0	-	1	237	3	144	1(e) 1(a)	103
Indiana	33	13,400	1	-	2	352	1	-	18	5,496	8	4,788	0	-	0	..	0	-	3(c)	2,764
Washington	70	30,600	3	1,600	19	8,048	3	340	19	8,727	19	6,334	2	410	0	-	0	-	4(c) 1(a)	5,141
Westmoreland	88	41,700	5	1,321	10	1,334	3	305	31	22,777	26	7,136	4	1,640	0	-	0	-	2(b) 1(h) 1(k) 2(i) 1(m) 2(c)	7,185
Total	472	244,700	16	10,208	77	18,477	18	2,770	196	95,594	104	43,932	14	9,121	5	3,423	5	1,441	4(a) 1(c) 6(b) 2(g) 15(c) 1(h) 1(d) 2(i) 1(j) 2(k) 1(l) 1(m)	59,734
% of Total	100%	8.5% **	3.4%	4.2%	16.3%	7.6%	3.8%	1.1%	41.5%	39.0%	22%	18%	3%	3.7%	1.1%	1.4%	1.1%	0.6%	7.8%	24.4%

* Advanced treatment is defined as microstraining, sand filtration or stabilization ponds.

** Based on 1970 population of 2,875,000

Footnotes:
(a) No information
(b) Trickling filter
(c) No treatment
(d) Stabilization pond/sand filtration
(e) Sand filtration/polishing pond
(f) Septic tank/trickling filter
(g) Pre-Aeration
(h) Trickling filter/sand filtration
(i) Trickling filter/extended aeration
(j) Imhoff Tank/extended aeration
(k) Contact stabilization
(l) Activated sludge/sand filtration
(m) Primary settling/sand filtration

receiving rivers in these areas have to assimilate large volumes of discharge. For example, Table 2.1.6.-41 lists the important municipal facilities in COWAMP Area #9 having a discharge greater than one million gallons per day, and names their receiving streams. Table 2.1.7.-42 tabulates total waste flows for large urban areas in COWAMP Study Areas #8 and #9. This table also compares total waste flows to average and 7-day, 10-year low flows of receiving streams. Although Pittsburgh has, by far, the largest waste flow (almost 200 million gallons per day) there is greater potential impact on water quality from several of the smaller urban areas. For example, five urban areas in COWAMP Area #9 have a total waste flow which is about 20% of the average receiving stream flow. These areas are: (2)

- Uniontown area on Redstone Creek
- Washington area on Chartiers Creek
- Greensburg area on Jack's Run
- Jeannette-Irwin area on Brush Creek
- Bethel Park-Pleasant Hills area on Peters Creek

COWAMP Area #8 does not have any urban waste flows greater than 1.4% of the average receiving stream flow so the potential water quality impact is not high from that source. (1)

It is not always large urban discharges that have a high potential for creating wastewater problems. In some cases municipal and non-municipal discharges from smaller areas may cause a greater impact if the receiving stream is small or if wastes are poorly treated. For example, serious problems may occur on small streams by discharge from small extended aeration plants that are poorly maintained or where the ratio of waste flow to stream flow is high. Table 2.1.6.-43 lists the municipal facilities that discharge to small streams and compares the waste flow for each facility with the average flow and 7-day, 10-year low flow for each receiving stream. There are some alarmingly high

TABLE 2.1.6.-41

IMPORTANT MUNICIPAL FACILITIES BY FLOW: COWAMP AREA #9

Source (2)

Facility Name	County	QTP (mgd)	Receiving Stream	Treatment Method
Piney Fork System	Allegheny	2.7	Piney Fork Cr.	Secondary
Coraopolis MSA	Allegheny	2.7	Ohio R.	Primary
Upper Allegheny JSA	Allegheny	4.0	Allegheny R.	Primary
McKeesport WPCA	Allegheny	5.5+	Monongahela R.	Primary
Sandy Creek STP	Allegheny	2.1	Sandy Cr.	Secondary
ALCOSAN Pgh.	Allegheny	190	Ohio River	Secondary
Pleasant Hills MA	Allegheny	2.4	Lick Run	Secondary
Aliquippa STP	Beaver	3.2	Ohio R.	Secondary
Beaver Falls STP(a)	Beaver	2.1	Beaver R.	Primary
Butler Area STP	Butler	4.5	Connoquenessing R.	Secondary
Connellsville STP	Fayette	2.0	Youghiogheny R.	Primary
Uniontown STP	Fayette	4.0	Redstone Cr.	Secondary
Indiana MSS	Indiana	6.0	Two Lick Cr.	Secondary
Canonsburg-Houston STP(a)	Washington	2.9	Chartiers Cr.	Primary
Mon. Valley Auth. STP	Washington	2.9	Monongahela R.	Secondary
Washington STP(a)	Washington	4.5	Chartiers Cr.	Secondary
Kiski Valley WPCA	Westmoreland	2.5	Kiskiminetas R.	Secondary
Greensburg STP	Westmoreland	5.0	Jack's Run	Secondary
Jeanette STP	Westmoreland	2.7	Brush Cr.	Secondary
Latrobe STP(a)	Westmoreland	2.1	Loyalhanna Cr.	Primary
N. Kensington STP	Westmoreland	6.0	Allegheny R.	Primary
W. Westmoreland STP	Westmoreland	11.0	Brush Cr.	Tertiary
Unity Twp. SS	Westmoreland	1.6	Four Mile Run	None

TABLE 2.1.6.-42 WASTE FLOW AND STREAM FLOW FOR MAJOR URBAN AREAS

COWAMP AREA #8

Source (1)

Urban Area	Waste Flow (mgd)	Receiving Stream	Average Flow (cfs)	% Waste Flow of Average Flow	Low Flow (cfs)	% Waste Flow of Low Flow
Meadville		French Creek	1,400[1]		70	
5 Municipal Facilities	3.97					
14 Private Facilities	0.2705					
Total	4.2405			0.47		9.4
Sharon		Shenango River[2]	713		204*	
6 Municipal Facilities	5.56					
13 Private Facilities	0.696					
Total	6.256			1.4		4.7
New Castle		Beaver River[3]	2,335		495	
2 Municipal Facilities	5.07					
18 Private Facilities	0.242					
Total	5.312			0.35		1.7
Warren		Allegheny River[5]	3,758		170*	
2 Municipal Facilities	2.71					
14 Private Facilities	1.0463					
Total	3.7563			0.15		3.4
Oil City - Franklin		Allegheny River[6]	10,250		1,000[4]	
4 Municipal Facilities	4.7					
10 Private Facilities	0.1227					
Total	4.8227			0.073		0.70

Notes:
* Flow controlled by reservoir
1 Estimated from drainage area
2 Gaging station at Sharpsville
3 Gaging station at Wampum
4 Low flow for 1973 water year from USGS records
5 Gaging station at Kinzua Dam
6 Gaging station at Franklin

Average flow data taken from USGS gaging station data, except where noted.
Low flow estimated from drainage area and low flow areal yields as given in the UDOM data base prepared by Buchart-Horn, Inc., except where noted.

TABLE 2.1.6.-42 (Continued)

WASTE FLOW AND STREAM FLOW FOR MAJOR URBAN AREAS

COWAMP AREA #9

Source (2)

Urban Area	Waste Flow (mgd)	Receiving Stream	Avg.Flow (cfs)	% Waste Flow of Avg.Flow	Low Flow (cfs)	% Waste Flow of Low Flow
Kittanning-Ford City		Allegheny River	15,460	0.03	1,550*	0.27
7 Municipal Facilities	2.630					
6 Non-Municipal Facilities	0.100					
Total	2.730					
Beaver Falls-New Brighton		Beaver River	3,379	0.15	552	0.96
5 Municipal Facilities	3.179					
4 Non-Municipal Facilities	0.043					
Total	3.222					
Aliquippa-Rochester		Ohio River	32,680**	0.05	5,505	0.27
13 Municipal Facilities	9.470					
7 Non-Municipal Facilities	0.212					
Total	9.682					
Butler		Connoquenessing Creek	161**	4.66	40.0	18.77
8 Municipal Facilities	4.816					
1 Non-Municipal Facility	0.038					
Total	4.854					
Uniontown		Redstone Creek	41.8**	24.92	1.2	868
5 Municipal Facilities	6.660					
7 Non-Municipal Facilities	0.073					
Total	6.733					
Connellsville		Youghiogheny River	2,533	0.15	249	1.5
4 Municipal Facilities	2.410					
2 Non-Municipal Facilities	0.017					
Total	2.427					
Indiana		Two Lick Creek	150**	6.21%	12.1	77.0
1 Municipal Facility	6.000					
2 Non-Municipal Facilities	0.021					
Total	6.021					

TABLE 2.1.6.-42 (Continued)

Urban Area	Waste Flow (mgd)	Receiving Stream	Avg.Flow (cfs)	% Waste Flow of Avg.Flow	Low Flow (cfs)	% Waste Flow of Low Flow
Washington		Chartiers Creek	32.7**	22.1	0.69	1,046
5 Municipal Facilities	4.611					
8 Non-Municipal Facilities	0.053					
Total	4.664					
Canonsburg		Chartiers Creek	81.4**	6.42	1.72	304
2 Municipal Facilities	3.370					
2 Non-Municipal Facilities	0.009					
Total	3.379					
Vandergrift		Kiskiminetas River	3,051	0.13	488	0.82
1 Municipal Facility	2.500					
3 Non-Municipal Facilities	0.085					
Total	2.585					
Greensburg		Jack's Run	37.9**	20.7	0.23	3,408
4 Municipal Facilities	5.035					
2 Non-Municipal Facilities	0.031					
Total	5.066					
Jeannette-Irwin		Brush Creek	52.2**	17.2	0.31	2,893
8 Municipal Facilities	5.535					
9 Non-Municipal Facilities	0.262					
Total	5.797					
Latrobe		Loyalhanna Creek	358**	1.85	8.33	79.5
7 Municipal Facilities	4.237					
4 Non-Municipal Facilities	0.043					
Total	4.280					
Monongahela-Donora-Monessen-Charleroi-California		Monongahela River	8,758	0.17	907	1.66
18 Municipal Facilities	9.405					
11 Non-Municipal Facilities	0.303					
Total	9.708					

TABLE 2.1.6.-42 (Continued)

Urban Area	Waste Flow (mgd)	Receiving Stream	Avg.Flow (cfs)	% Waste Flow of Avg.Flow	Low Flow (cfs)	% Waste Flow of Low Flow
Bethel Park-Pleasant Hills		Peters Creek	38.7**	20.5	0.82	968
3 Municipal Facilities	5.130					
No Non-Municipal Facilities	-					
Total	5.130					
McKeesport-Duquesne-West Mifflin		Monongahela River	12,200	0.16	1,197	1.66
11 Municipal Facilities	12.752					
2 Non-Municipal Facilities	0.057					
Total	12.809					
New Kensington-Brackenridge		Allegheny River	19,030	0.10	3,798	0.51
5 Municipal Facilities	12.360					
1 Non-Municipal Facility	0.096					
Total	12.456					
Pittsburgh ***		Ohio River	32,530	0.94	5,500	5.55
26 Municipal Facilities	196.493					
18 Non-Municipal Facilities	0.741					
Total	197.234					

* Low flow in 1973 water year, from USGS gaging station.

** Estimated from drainage area given in UDOM data base and average areal yield in nearest USGS gaging station.

*** The facilities listed are only those which discharge into watershed 20G. This includes ALCOSAN, which treats wastes from most of the Pittsburgh area and has a flow of 190 mgd.

NOTE: Average flows are from USGS gaging stations except where noted otherwise. Low flows are calculated from drainage area and low flow area yields given in the UDOM data base prepared by Buchart-Horn, Inc., except where noted otherwise. Low flows, therefore, do not include flows from municipal treatment plants.

TABLE 2.1.6.-43 MINICIPAL WASTE DISCHARGES TO SMALL STREAMS: COWAMP AREA #8

Source (1)

Borough	Waste Flow (mgd)	Receiving Stream	Average Flow (cfs)	% Waste Flow of Average	Low Flow (cfs)	% Waste Flow of Low Flow
Clarion County						
Knox	0.150	Canoe Creek	20	1.2		
Rimersburg	0.08	Wildcat Run	5	2.5		
Elk County						
St. Mary's	1.5	Elk Creek	20	11.6	3.7	63
Ridgeway	1.5	Elk Creek	110	2.1	9.8	24
Jefferson County						
Sykesville	0.055	Stump Creek	50	0.2		
Lawrence County						
New Wilmington	0.2	L.Neshannock Creek	150	0.2	3	10.3
Mercer County						
Mercer	0.377(a)	Neshannock Creek	180	0.3	5	11.7
Grove City	1.159(b)	Wolf Creek	120	1.5		
McKean County*						
Bradford	4.8	Tunnungwant Creek	250	3.0	16	46
Kane (Kinzua Road)	0.35	Hubert Run	20	2.7		
(West Run)	0.35	West Run	20	2.7		
Mt. Jewett	0.15	Kinzua Creek	74	0.3	5	4.6
Potter County*						
Coudersport	0.62	Allegheny River	170	0.6	4	24
Venango County						
Pleasantville	0.064	Pithole Creek	5	2.0		

* McKean and Potter Counties are not in the ORBES Region

(a) Includes East Lackawannock Township municipal plant and several private facilities. Flow measured at Mercer.

(b) Includes several private facilities.

Low flow data included only where available from the UDOM data base prepared by Buchart-Horn, Inc. Average flow data estimated from drainage area.

TABLE 2.1.6.-43 (Continued)

MUNICIPAL WASTE DISCHARGES TO SMALL STREAMS:

COWAMP AREA #9

Source (2)

Municipality	Waste Flow (mgd)	Receiving Stream	Avg.Flow (cfs)	% Waste Flow of Avg.Flow	Low Flow (cfs)	% Waste Flow of Low Flow
ALLEGHENY COUNTY						
Hampton Twp. (Allison Park STP)	0.5	Pine Creek	58.1	1.33	0.98	79
McCandless Twp. (Longvue #1 STP)	1.1	Little Pine Creek	1.61	106	0.03	5,676
Moon Twp. (Fern Hollow Road STP)	1.7	Montour Run	43.6	6.04	0.73	360
Penn Hills Twp. (Long Road STP)	0.85	Chalfont Run	1.75	75.2	0.01	13,158
Gascola STP	1.3	Thompson Run	5.0	40.2	0.04	5,031
Plum Creek STP	0.85	Plum Creek	24.6*	5.3	0.18*	731
Plum Borough (Holiday Park STP)	0.8	Abers Creek	8.9	13.9	0.07	1,770
BUTLER COUNTY						
Cranberry Twp. (Fenway & Porch Road Plants)	0.659	Brush Creek	14.9*	6.85	0.33*	309
GREEN COUNTY						
Waynesburg	0.78	South Fork Ten Mile Creek	150	0.80	0.137	881
FAYETTE COUNTY						
Georges Twp.	0.716**	Georges Creek	17.4	6.37	0.0	-

TABLE 2.1.6.-43 (Continued)

Municipality	Waste Flow (mgd)	Receiving Stream	Avg.Flow (cfs)	% Waste Flow of Avg.Flow	Low Flow (cfs)	% Waste Flow of Low Flow
WASHINGTON COUNTY						
Peters Twp. (Brush Run STP)	0.8	Brush Run	7.1	17.4	0.19	652
Ellsworth-Bentleyville Area (Pigeon Creek STP)	1.02***	Pigeon Creek	39.4	4.01	1.18	134
WESTMORELAND COUNTY						
Franklin Twp. (Franklin Twp. STP)	1.4	Turtle Creek	60.3	3.59	0.44	493
Ligonier	0.6	Loyalhanna Creek	55.3	1.68	1.98	46.9
Mt. Pleasant	0.91	Shupe Run	4.1	34.4	0.16	880
Scottdale-Everson Area	1.18	Jacobs Creek	79.5	2.30	0.52	351

* Drainage area estimated from map; low flow areal yields taken from UDOM data base for Nearest stream.

** Raw Sewage

*** Treatment plant is under construction as of 1975.

NOTE (1): Average flows are calculated from drainage areas given in the UDOM data base prepared by Buchart-Horn, Inc. and areal yields at the nearest USGS gaging station. Low flows are calculated from drainage areas and low flow yields given in the UDOM data base. Neither average nor low flows include the flows from municipal waste treatment plants.

NOTE (2): Only discharges greater than 0.5 mgd have been listed for Area #9.

ratios of waste flow relative to the average flow for small streams - one in excess of 100% on Little Pine Creek in Allegheny County. The other high percentages occur on Chalfont Run, Thompson Run, Abers Creek, Brush Run and Shupe Run in COWAMP Area #9 and Elk Creek and Tunungwant Creek in Area #8.

Furthermore, regardless of the flows, there are numerous discharges which are raw or receiving only primary treatment. They are, therefore, in violation of Federal standards and are considered to be degrading the water quality of their receiving streams. Most problems concerning municipal discharges are attributed to these discharges. 46% of municipal facilities in COWAMP Area #9 have raw discharges and 6% have only primary treatment. In COWAMP Area #8 these figures are 11% and 18% respectively (see Table 2.1.6.-39). COWAMP Area #9 report (2) examines this problem on a county-by-county basis, while COWAMP Area #8 report (1) looks at it by watersheds. Extracts from both reports are reproduced below. The water quality network sampling stations cited are defined in Table 2.1.6.-3.

COWAMP AREA #9

In Allegheny County, WQN sampling stations on the Ohio River (Station 902), the Monongahela River (Station 701), Chartiers Creek (Station 914), and Abers Creek (Station 705) show minimum dissolved oxygen (DO) concentrations below standards. Although some of the problem can be attributed to industrial wastes, municipal wastes are probably the principal source of the oxygen demanding material. Other streams depressed by sewage are Plum Creek, Turtle Creek, Montour Run, and New England Hollow Run (site of the 1.2 mgd West Mifflin sewage treatment plant). Deer Creek, Pine Creek, and Peters Creek have been described as being affected by sewage; but sampling stations on these streams show acceptable DO levels, possibly because samples were collected not more than four times per year. The DO for Peters Creek is surprising in view of the high volume of wastes relative to stream flow.

Armstrong County is bordered by Redbank Creek in the north and the Kiskiminetas River in the south. Both streams have had quality problems resulting from raw discharges. Problems in Redbank come from out of the study area; problems in the Kiskiminetas will be discussed under Westmoreland County. Cowanshannock Creek is depressed in the headwaters by sewage, notably the raw discharge at Rural Valley. The creek recovers downstream and at WQN Station 841 indicates no DO problems.

The Beaver River already carries a significant organic load when it enters Beaver County, and water quality is further depressed by sewage treatment plants in the county; two of the larger plants (Beaver Falls and New Brighton) are providing only primary treatment, although upgrading is in progress at both facilities. With the exception of Station 903 on Raccoon Creek, no other WQN stations in Beaver County indicated DO levels below standards. Numerous small treatment plants on the Raccoon Creek may be the cause of the low DO levels.

Many streams in Butler County are affected by municipal wastewater treatment facilities. Connoquenessing Creek has nutrient problems from the sewage treatment plants in the Butler area. Saw Mill Run, a small tributary of Connoquenessing Creek, is depressed downstream from the Deshon treatment plant. Thorn Creek has problems caused by the Saxonburg facility, which has been proposed for upgrading. Breakneck Creek and Brush Creek have problems at low flow from sewage treatment facilities scattered along the streams. South Branch Bear Creek is severely depressed by raw sewage discharges from Bruin, Petrolia, and Karns City.

Redstone Creek in Fayette County is severely affected by sewage, having average DO levels below standards. Raw sewage discharges in the Uniontown area are responsible for this degradation. Dunlap Creek and Georges Creek both have problems with raw municipal discharges at the headwaters.

In Greene County, the South Fork Tenmile Creek experiences stream degradation from raw sewage. There are occasional problems resulting from the Waynesburg discharge even though secondary treatment is provided because of the wide ratio between average stream flow and low flow. Dunkard Creek and Muddy Run experience problems from municipal discharges receiving only primary treatment.

Indiana County has water quality problems in Two Lick Creek caused by raw discharges in Clymer and Homer City; treatment plants are planned at both locations. Raw discharges from Center Township are having some effect on Black Lick Creek. The Conemaugh River is degraded from municipal wastes. Most of the load comes from outside the study area, but raw discharges in Indiana and Westmoreland Counties add to the problem.

In Washington County there are two large urban areas on Chartiers Creek, and the creek is affected by sewage discharges. Because of the large waste flow relative to stream flow and the use of the stream, tertiary treatment has been ordered for the major municipal plants in both areas. Pigeon Creek also has problems from high waste volumes relative to stream flow. The Monongahela River is experiencing some degradation from raw discharges. Raw discharges also are causing problems on Dutch Fork, Cross Creek, Pike Run, and Peters Creek.

Municipal discharges are scattered throughout Westmoreland County, and many localized problem areas on small streams may not have been identified. The Kiskiminetas River has been depressed by raw discharges in the Vandergrift area; but these problems should be corrected by the new Kiskiminetas Valley sewage treatment plant. Sewickley Creek is in good condition upstream of Jack's Run, but Jack's Run is depressed by sewage, and raw discharges occur on several other tributaries. Jacobs Creek is depressed upstream by sewage but recovers downstream from Scottsdale. Despite problems in tributaries in Westmoreland and Fayette Counties, the Youghiogheny River is not significantly degraded. A WQN station on the Youghiugheny in Westmoreland County (707) did have a minimum DO value below standards. Stations on Sewickley Creek (715) and the Kiskiminetas River (809) also indicated low DO concentrations; stations on the Conemaugh River, Loyalhanna Creek, Allegheny River, Jacobs Creek, and Turtle Creek indicated satisfactory DO levels.

In several cases municipal facilities have been identified as affecting stream quality while data indicate only slight effects on dissolved oxygen; for example, at WQN station (916) just below Canonsburg on Chartiers Creek, all DO values satisfied standards. In these cases impacts are based on levels of the nutrients, nitrogen and phosphorus. Concentrations of these nutrients found in streams draining non-urban, forested watersheds in northern Pennsylvania generally were less that 0.06 mg/l total phosphorus as P, less than 0.15 mg/l ammonia as N, and less than 0.3 mg/l nitrate as N. Of the 50 sampling stations in the study area, 10 had total phosphorus levels less than 0.1 mg/l as P, 25 had ammonia concentrations less than 0.2 mg/l as N, and 5 had nitrate levels less than 0.6 mg/l as N. None of the WQN stations had concentrations of all three parameters below background levels found in northwestern Pennsylvania, and only station 840 had concentrations of both phosphorus and ammonia within the range of background levels found in northwestern Pennsylvania. Actual "background" levels vary depending on the area and other sources of nutrients exist, but municipal wastes are a major contributor to high levels of nutrients in surface waters in the study area. Concentrations of ammonia and total phosphorus at the station on Chartiers Creek below Canonsburg (916), for example, averaged 1.59 mg/l as N and 1.04 mg/l as P. These nutrients may lead to eutrophication under certain conditions... (2)

COWAMP AREA #8

Apart from the Bradford Plant, the only major municipal treatment plants...having a severe impact on the receiving stream are those plants providing primary treatment or discharging raw wastes...Major municipalities served by facilities providing only primary treatment as of March 1975 are Titusville on Oil Creek (Watershed 16E), Brookville on Redbank Creek (Watershed 17C), Ellwood City on Connoquenessing Creek (Watershed 20C), and Farrell on the Shenango River (Watershed 20A). Upgrading is in progress at Ellwood City and Farrell. There is a major municipal discharge of raw sewage from Falls Creek Borough on Sandy Lick Creek (Watershed 17C). Treatment plants are planned at Falls Creek and Brookville pending federal funding. Other discharges of raw or primary treated wastes are: in Clarion County, New Bethlehem on Redbank Creek (17C), and Sligo on Licking Creek (17B); in Crawford County, Saegertown on Woodcock Creek (16A) and Bloomfield Township on Canadohta Lake (16E); in Forest County, Tionesta on the Allegheny River (16F); in Jefferson County, Snyder Township on Little Toby Creek (17A); in Lawrence County, Ellport on Connoquenessing Creek (20C), Neshannock Township on a tributary of the Shenango River (20A), and Wampum on the Beaver River (20B); in McKean County, East Smethport on Potato Creek (16C); in Mercer County, East Lackawannock on a tributary of Neshannock Creek (20A) and West Middlesex on the Shenango River (20A); in Potter County, Ulysses on the Genessee River (14A); in Venango County, Cooperstown on Sugar Creek (16D) and Emlenton on the Allegheny River (16G). Private facilities discharging untreated wastes are the Carbon Limestone Company in Lawrence County and the Grandview Convalescent Home in Venango County...(1)

B. Industrial Wastewaters

Pittsburgh and its vicinity is the most highly industrialized section of Pennsylvania and is a major steel producing area of the United States. Within COWAMP Study Area #9 there are 550 direct stream industrial dischargers that generate an average wastewater flow of 2,260 million gallons per day. This flow is approximately 9.4% of the average 1973 flow of the Ohio River at Sewickley. COWAMP Area #8 to the north is not a highly industrialized area, so the major potential for water quality impact from industrial waste lies in Allegheny and surrounding counties.

The state requirements governing industrial waste discharge are contained in Chapter 97 of the Department of Environmental Resources "Rules and Regulations" (12). The requirements relating to mineral preparation, oil and natural gas wells, underground disposal and heat pollution from the existing version of Chapter 97 (40) are presented in Table 2.1.6.-44.

Recently, in February, 1978 (3), and March, 1978 (11), there were proposed revisions to delete sections of the Chapter because some jurisdiction will be transferred to Chapter 95 concerning wastewater treatment and will no longer be the domain of industrial waste. Most of the subject matter to be deleted deals with milk processing, the paper industry and organic waste from distilleries and tanneries (3). The section on heat pollution has been rewritten in accord-

TABLE 2.1.6.-44

EXISTING INDUSTRIAL WASTE TREATMENT REQUIREMENTS
Sources (12), (40)

TITLE 25. RULES AND REGULATIONS
PART I. DEPARTMENT OF ENVIRONMENTAL RESOURCES
Subpart C. PROTECTION OF NATURAL RESOURCES
ARTICLE II. WATER RESOURCES

CHAPTER 97. INDUSTRIAL WASTES

Authority

The provisions of this Chapter 97 issued under act of June 22, 1937, P.L. 1987 § 5 (35 P.S. § 691.5).

Source

The provisions of this Chapter 97 adopted

GENERAL PROVISIONS

§ 97.1. Definitions.

The following words & terms, when used in this Chapter, shall have the following meanings, unless the context clearly indicates otherwise:

Daily Average - The arithmetic average of all daily determinations made during a calendar month.

Daily Determination - The arithmetic average of all determinations made during a 24-hour period.

Federal Water Pollution Control Act - The Federal Water Pollution Control Act (33 U.S.D. §§ 1251 et seq.) as amended.

§ 97.2. Degrees of treatment required.

(a) In issuing its orders for abatement or treatment of polluting wastes to the waters of this Commonwealth, the Department shall set forth the degree of treatment required in terms of the treatment of sewage and shall specify that in the case of industrial wastes they shall be given equivalent treatment.

(b) The tests to be applied to such wastes shall be those appropriate to the particular type of waste under consideration, as well as suitable for determining equivalency.

(c) As the equivalency of various industrial wastes is determined periodically by the Department, the information shall be made available to the public in the form of standards for industrial wastes.

STANDARDS

§ 97.11. Special Values.

In order to specify the required reduction in pollution load of wastes

TABLE 2.1.6.-44 (Continued)

from various sources, certain values shall represent the "normal raw waste characteristics" from various manufacturing processes. Except where, in the opinion of the Department, special conditions require some modification of these values, the reduction in pollution load required shall be computed from adopted and applicable standards.

§ 97.12. Effluent characteristic standards.

In some cases the Department shall adopt standards with respect to the characteristics of the effluent discharged to the receiving stream or as to the amount, rate or manner in which the wastes may be discharged. These standards shall be revised when, in the opinion of the Department, changed conditions or increased knowledge warrant the revision.

§ 97.13. Characteristics of waste water.

The characteristics of the waste waters from an industrial establishment to be used in determining compliance with standards established by the Department for "normal" raw wastes and final effluent shall be those due to changes or additions resulting from the use of the water by the industry.

§ 97.14. Measures to be used.

The pollution load of wastes shall be reduced to the maximum extent practical by process changes, segregation of strong wastes, reduction in volume and re-use of water, and by general measures of "good housekeeping" within the plant. The term "practical" shall not be limited to profitable or economical.

§ 97.15. Quality standards.

Industrial wastes regulated by this Chapter shall meet the following quality standards:

(1) There shall be no discharge of wastes which are acid.

(2) Wastes shall have a pH of not less than 6.0 and not greater than 9.0 except that wastes discharged to acid streams may have a pH greater than 9.0

(3) Wastes shall not contain more than 7.0 mg/l of dissolved iron.

(4) When surface waters are used in the industrial plant, the quality of the effluent need not exceed the quality of the raw water supply if the source of supply would normally drain to the point of effluent discharge.

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MINERAL PREPARATION

§ 97.31. Coal washeries.

Operators of all coal washeries constructed in this Commonwealth, whether a closed system or not, shall be required to submit an application and plans and secure a permit from the Department prior to placing the facilities in operation.

§ 97.32. Discharges to surface waters.

Wastes discharged to surface waters of this Commonwealth from mineral preparation, handling or processing plants shall meet the following quality standards:

(1) Wastes shall contain no more than 200 mg/l of suspended solids.
(2) There shall be no discharge of acid wastes.
(3) Wastes shall have a pH of not less than 6.0 nore more than 9.0
(4) Wastes shall not contain more than 7.0 mg/l of dissolved iron.
(5) When surface waters are used in the mineral preparation plant, the quality of the effluent need not exceed the quality of the raw water supply if the source of supply would normally drain to the point of effluent discharge.

§ 97.33. Discharges to underground waters.

Wastes discharged to the underground waters of this Commonwealth shall meet one of the following conditions:

(1) The quality standards set forth in § 97.32(2) - (4) of this Title (relating to discharges to surface waters).
(2) That the wastes shall be discharged in accordance with the conditions of a permit issued under the provisions of § § 97.71 - 97.75 of this Title (relating to underground disposal of wastes).
(3) That the wastes shall be discharged into mine workings where the wastes do not adversely affect the quality of the mine drainage.

§ 97.34. Drainage from active mineral refuse.

Drainage from active mineral refuse piles, mineral stockpiles and related facilities, other than seasonal surface run-off caused by precipitation on the refuse and stockpiles, shall meet the quality standards of § 97.32 of this Title (relating to discharges to surface waters).

§ 97.35. Disposal of solids from water-borne wastes.

The disposal of solids removed from water-borne wastes shall be conducted so that the solids are not washed, conveyed or otherwise deposited into the surface waters of this Commonwealth.

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OIL AND NATURAL GAS WELLS

§ 97.51. Sumps.

(a) A sump shall be provided for each well drilling operation.
(b) Each sump shall be large enough to receive without overflow all drill cuttings, water and oil that may be produced in the drillings and cleaning of the well.
(c) Surface water shall be excluded from the sumps by means of diversion ditches on the uphill sides, or by other appropriate measures.
(d) After completion of the well, any oil and basic sediment that has accumulated shall be burned or disposed of in such a manner as to avoid a fire hazard.
(e) Propoer measures shall be taken to prevent sump contents from being washed into streams.

§ 97.52. Sump overflow device.

In case abnormally large quantities of water are encountered in drilling, as to exceed the capacity of the sump, the sump shall be provided with a suitable overflow device and the water shall be discharged to the sump at a rate and manner that any overflow from the sump will be free of settleable solids and substantially free of turbidity.

§ 97.53. Sump equivalent.

Where the location of a well precludes or makes unnecessary the use of a sump, equivalent measures shall be taken to prevent the pollution of the waters of this Commonwealth.

§ 97.54. Domes for wells.

(a) If large volumes of oil are encountered in shooting a well, a dome shall be placed over the well or other suitable measures shall be taken to prevent the discharge of any oil to the waters of this Commonwealth.

(b) Oil wastes shall not be dumped or drained upon the surface of the ground in such a manner that they may flow or be washed into the waters of this Commonwealth.

§ 97.55. Waste tanks.

For all producing wells, adequate provision shall be made to receive all salt water, oil and BS in tub tanks or suitable containers from which all such wastes, tank bottoms and other petroleum residues shall be discharged into one or more sumps of adequate size, or into equivalent settling devices, equipped with baffles, siphons or other suitable means to prevent all oil and residues from reaching the waters of this Commonwealth.

§ 97.56. Cleaning operations.

Cleaning tubing or other apparatus connected with the operation of an oil well shall be done in a manner and location that the wastes shall not drain or be washed into a stream, and in such a manner that combustible wastes can and will be burned periodically, using proper precautions to control the fire.

§ 97.57. Receiving tanks.

(a) All run tanks, separators or siphon tanks shall be so located that salt water, oil, BS or other wastes will be discharged into one or more sumps of adequate size to receive and settle the wastes, and so located as not to be washed out by stream flows. Any water from such sumps shall be discharged through a siphon or other suitable device so installed as to prevent any oil or petroleum residues from reaching the waters of this Commonwealth.

(b) Oil and petroleum residues shall be periodically burned using proper precautions to control the fire.

§ 97.58. Water filter backwash.

(a) The backwash from the operation of water filters shall be settled in sumps or equivalent devices adequate to provide at least an eight-hour retention period, and so arranged as to provide quiescent sedimentation and the discharge of the clarified effluent free from settleable solids and substantially free from turbidity.

(b) The sludge from any sedimentation basins which precede the filter units shall be removed periodically and disposed of in such a manner so as not to be drained or washed into the waters of this Commonwealth.

OTHER WASTES

§ 97.61. Wells other than oil or gas.

(a) At each well drilling operation there shall be provided a sump or other receptacle large enough to receive all drill cuttings, sand bailings, water having a turbidity in excess of 1,000 ppm, or other polluting wastes resulting from the well drilling operations.

(b) Surface water shall be excluded from the sump or receptacle by means of diversion ditches on the uphill sides, or by other appropriate measures.

(c) After completion of the well the sump shall be covered over or otherwise protected or the contents of the receptacle disposed of, so that the contents will not be washed into the waters of this Commonwealth.

(d) Any waste oil, coal, spent minerals or other polluting substances shall be so disposed of that they will not be washed into the waters of this Commonwealth.

§ 97.62. Reserved.

§ 97.63. Oil Bearing Waste Waters.

(a) For the purpose of this section, the quantity of oil shall be measured by the freon extraction gravimetric method of oil analysis (Standard Methods for the Examination of Water and Wastewater - Method 502A; 14th Edition, published by the American Public Health Association, America Waterworks Association and the Water Pollution Control Federation, 1015 18th Street N.W., Washington, D.C. 20036).

(b) Wastewaters, except those from petroleum marketing terminals, discharged into the waters of this Commonwealth shall comply with all of the following:

(1) At no time cause a film or sheen upon or discoloration of the waters of this Commonwealth or adjoining shoreline; and

(2) At no time contain more than 15 milligrams of oil per liter as a daily average value nor more than 30 milligrams of oil per liter at any time, or whatever lesser amount the Department may specify for a given discharge or type of discharge as being necessary for the proper protection of the public interest or to meet any requirements based upon the Federal Water Pollution Control Act.

(c) Petroleum marketing terminals shall be provided with facilities to remove oil from waters, including stormwater runoff, before discharge into the waters of this Commonwealth. Compliance with this subsection shall constitute compliance with subsection (b) of this section except to the extent that the Federal Water Pollution Control Act imposes a more stringent requirement. Pollution Incident Prevention Plans as described in Section 101.3 of this title (relating to activities utilizing polluting substances), are required for all petroleum marketing terminals.

(d) Unless it can be shown that an alternate design is equivalent, oil removal facilities of petroleum marketing terminals shall consist of an American

Petroleum Institute (A.P.I.) oil separator designed and operated in accordance with the following standards:

(1) The horizontal velocity through the separator shall not exceed three feet per minute except when rainfall produces a runoff exceeding 80 gallons per minute per acre of land draining to the separator. When such runoff occurs there will be no limit on the horizontal velocity.

(2) The detention time of water flowing through the separator shall be at least 20 minutes except when rainfall produces a runoff exceeding 80 gallons per minute per acre of land draining to the separator. When such a rainfall occurs the detention time may be less than 20 minutes.

(3) The separator shall be capable of treating 80 gallons per minute for each acre of land draining to it during the runoff period.

(4) Solids build up in the separator shall be measured after each rainfall, and when the build up exceeds one foot in depth from the bottom, the solids shall be removed before the next rainfall.

(5) The separator shall be inspected after each rainfall to insure that the oil is being properly removed. Excessive oil shall not be allowed to accumulate in the separator.

(6) Oil and solids, removed from the separator shall be disposed of in a manner that will not violate the laws of the Commonwealth.

(7) A record showing the dates when solids and oil are removed from the separator and the location of the disposal site shall be kept and maintained for a period of one year.

(e) Where the standard design in subsection (d) of this section or an equivalent alternate design are followed, no permit for the discharge of oil from petroleum marketing facilities to the waters of this Commonwealth shall be required pursuant to Section 307 of the act of June 22, 1937, P.L.1987, as amended (35 P.S. § 691.307).

§ 97.64. Distillery wastes.

Distillery waste waters shall be completely evaporated or shall be given enough equivalent treatment before discharge to the waters of this Commonwealth to remove not less than 95% of the five-day BOD of the wastes.

§ 97.65. Tannery waste waters.

(a) The process for the treatment of waste waters resulting from the vegetable tanning of leather, as set forth in the report of the Tannery Waste Disposal Committee of Pennsylvania to the Sanitary Water Board, dated November 8, 1930, shall be considered by the Department to be reasonable and practicable.

(b) Tannery waste waters shall be treated by one or more of the steps set forth in such report, as may be required by the Department for particular streams or locations.

§ 97.66. Reserved.

UNDERGROUND DISPOSAL

§ 97.71. Potential pollution.

The Department shall, except as otherwise provided in this section consider the disposal of wastes, including storm water runoff, into the underground as potential pollution unless the disposal is close enough to the surface so that the wastes will be absorbed in the soil mantle and be acted upon by the bacteria naturally present in the mantle before reaching the underground or surface waters.

§ 97.72. Discharge into mines.

Discharge of inadequately treated wastes, except coal fines, into the underground workings of active or abandoned mines shall be prohibited.

§ 97.73. Discharge into wells.

Discharge of wastes into abandoned wells shall be prohibited.

§ 97.74. Disposal in underground horizons.

(a) Disposal of wastes into underground horizons shall only be accepted as an abatement of pollution when the applicant can show by the log of the strata penetrated and by the stratigraphic structure of the region that it is improbable that the disposal would be prejudicial to the public interest. Acceptances shall be conditional and shall not relieve the applicant of responsibility for any pollution of the waters of this Commonwealth which may occur.

(b) If any pollution occurs the disposal operations shall be stopped immediately.

§ 97.75. New wells for waste disposal.

New wells constructed for waste disposal shall be subject to the provisions of § § 97.71 - 97.74 of this Title (relating to underground disposal of wastes).

HEAT POLLUTION

§ 97.81. Prohibition.

The temperature of the waters of this Commonwealth shall not be increased artificially in amounts which shall be inimical or injurious to the public health or to animal or aquatic life or prevent the use of water for domestic, industrial or recreational purposes, or stimulate the production of aquatic plants or animals to the point where they interfere with these uses.

§ 97.82. Allowable discharges.

(a) The heat content of discharges shall be limited to an amount which could not raise the temperature of the entire stream at the point of discharge 5°F. above ambient temperature or a maximum of 87°F., whichever is less, nor change the temperature by more than 2°F. during any one-hour period, assuming complete mixing but the heat content of discharges may be increased or further limited where local conditions would be benefited thereby.

(b) Where downstream circumstances warrant, the specific area in which the temperature may be artificially raised above 87°F. or greater than 5°F. above ambient temperature or by more than 2°F. during any one-hour period shall be prescribed.

§ 97.83. Fishways.

A fishway shall be required in streams receiving heated discharges where it is essential for the preservation of migratory pathways of game fish, or

TABLE 2.1.6.-44 (Continued)

for the preservation of important aquatic life. The dimensions of the fishway shall be prescribed in each case, dependent upon the physical characteristics of individual streams whenever necessary.

§ 97.84. Acid-impregnated streams.

Sections 97.82 and 97.83 of this Title (relating to heat and discharges into streams) shall not apply to streams so impregnated with acidic mine drainage that they cannot support a fish population typical of the region.

§ 97.85. Trout Streams.

There shall be no new discharge to waters providing a suitable environment for trout if as a result the temperature of the receiving stream would be by more than 5°F. above natural temperatures or be increased above 58°F.

§ 97.86. Estuarial waters.

(a) Reduction of heat content of discharges to estuarial waters shall be required where necessary to protect the public interest.

(b) Estuarial waters shall not be considered all those containing ocean salts. Tidal waters not containing ocean salts are considered as fresh water streams.

ance with the recently proposed Chapter 93 which sets water quality standards in general (11). Part of this section (dealing with aquatic life and estuary waters) will be deleted to clarify the division of responsibility between the three chapters. These proposed revisions are detailed in Table 2.1.6.-45.

There are 721 industrial direct stream discharges in COWAMP Study Areas 8 and 9. These are inventoried in Chapter VII, Appendix A of both the Area #8 and Area #9 COWAMP Reports (1), (2). Maps showing the location of facilities and discharges are available in the Plates in the COWAMP Reports for Areas #8, #9, #5, and #6. (1), (2), (3), and (4). The inventories list the following for each plant, county by county: name and owner, DER-WAMIS identification number, location (municipality and COWAMP Sub-basin), Standard Industrial Classification (SIC) Code, number of employees, total (both design and actual) wastewater flow, number of outfalls, treatment provided, receiving stream (name, condition, and classification), priority of discharge (based on a system of rating which considers potential water quality impact and flow rate of effluent), and estimates of area available for expansion of the facility. More specific and detailed information on each industrial plant and the wastewater discharges are given in subsequent tables of the COWAMP Reports for the 248 "major" industries--those with serious potential water quality impact and/or large wastewater flow rate.

A relatively small number of major industrial dischargers account for a large portion of the total industrial wastewater flow. For example, in Study Area #9, the 17 largest dischargers (3.0% of all industries, by number) account for over 93% of the total study area industrial wastewater flow.

A summary of areas with high concentrations of industrial facilities is given in Table 2.1.6.-46. The number of industrial facilities in the geographic area, the name of those with most severe impact, the total waste flow, and

TABLE 2.1.6.-45

PROPOSED REVISIONS TO INDUSTRIAL WASTE TREATMENT REQUIREMENTS
AS OF MARCH 1978

Sources (3), (11)

Deletion of Sections February 4, 1978:

§ 97.2,
§ 97.11 - 97.13,
§ 97.21 - 97.25,
§ 97.41 - 97.45,
§ 97.64 - 97.66.

HEAT POLLUTION

§ 97.82. [~~Allowable discharges~~] Relation to Federal actions.

[~~(a) The heat content of discharges shall be limited to an amount which could not raise the temperature of the entire stream at the point of discharge 5°F. above ambient temperature or a maximum of 87°F. during any one-hour period, assuming complete mixing but the heat content of discharges may be increased or further limited where local conditions would be benefitted thereby.~~

[~~(b) Where downstream circumstances warrant, the specific area in which the temperature may be artificially raised above 87°F. or greater than 5°F. above ambient temperature or by more than 2°F. during any one-hour period shall be prescribed.~~]

Subject to the provisions of § 97.83 of this title (relating to allowable discharges), effluent limitations upon the discharge of heated wastewaters to waters of this Commonwealth shall be established so as to attain and maintain the specific thermal water quality criteria of Chapter 93 of this title (relating to water quality standards) and the requirements of § 97.81 of this title (relating to prohibition); provided that, for the purpose of establishing thermal effluent limitations in a certification issued pursuant to section 401 of the Federal Water Pollution Control Act, 33 U.S.C.A. § 1341, or (35 P. S. §§ 691.1-691.1001) a permit issued pursuant to the provisions of The Clean Streams Law, the Department may rely upon a determination of the United States Environmental Protection Agency or a state, if appropriate, pursuant to Section 316(a) of the Federal Water Pollution Control Act and the regulations promulgated at 40 C.F.R. Part 122 (1977) if such determination was made as a result of a proceeding in which the Department was afforded a full opportunity to participate as a part and if such determination is final, including any judicial proceedings for direct review thereof; provided that, in any event, the Department may impose more stringent thermal limitations to protect the protected uses set forth in § 93.3 of this title (relating to protected water uses).

§ 97.83. [~~Fishways~~] Allowable discharges.

[~~A fishway shall be required in streams receiving heated discharges where it is essential for the preservation of migratory pathways of game fish, or for the preservation of important aquatic life. The dimensions of the fishway shall be prescribed in each case, dependent upon the physical characteristics of individual streams whenever necessary.~~]

(a) The Department may, in its discretion, grant exceptions to the requirement that all heated waste discharges be limited so as to maintain and attain the specific thermal water quality criteria of Chapter 93 of this title (relating to water quality standards) and § 97.81 of this title (relating to prohibition), provided that all of the following conditions are met:

(1) The discharger has demonstrated that the discharge is to receiving waters which are so impregnated with acidic drainage from inactive or abandoned coal mines that those waters cannot support a balanced community of aquatic life as defined in § 93.1 of this title (relating to definitions).

(2) There are neither current nor scheduled abatement programs nor enforcement actions directed toward restoration of the receiving waters.

(3) The discharger agrees, in writing, to upgrade the quality of the discharge so as to attain and maintain the specific thermal water quality criteria of Chapter 93 of this title (relating to water quality standards) and the requirements of § 97.81 of this title (relating to prohibition) when either of the following prevails:

(i) a current or scheduled abatement program is implemented or enforcement action is taken toward restoration of the receiving waters.

(ii) The receiving waters are significantly restored by natural or other means.

(4) The discharger agrees, in writing, to conduct a periodic chemical and biological monitoring program in the receiving waters.

(b) In any event, effluent limitations established for the discharge of heated wastewaters shall be sufficient to comply with any applicable requirements of Federal law.

§ 97.84. [Acid-impregnated streams.] (Reserved)

[Sections ~~97.82~~ and ~~97.83 of~~ this Title (relating to heat and ~~discharges into streams) shall not apply to streams so impregnated with~~ acidic mine drainage that they cannot support a fish population typical of the region.]

§ 97.85. [Trout streams.] (Reserved)

[There shall be no new discharge to waters providing a suitable environment for trout if, as a result, the temperature of the receiving stream would be by more than 5°F. above natural temperatures or be increased about 58°F.]

§ 97.86. [Estuarial waters.] (Reserved)

[(a) Reduction of heat content of discharges to estuarial waters shall be required where necessary to protect the public interest.]

[(b) Estuarial waters shall not be considered all those containing ocean salts. Tidal waters not containing ocean salts are considered as fresh water streams.]

TABLE 2.1.6.-46

AREAS WITH HIGH CONCENTRATIONS OF INDUSTRIAL DISCHARGES:

COWAMP AREA #9

Source (2)

Area	COWAMP Sub-Basin	Total No. Industrial Facilities	Facilities with Severe Impact	Total Industrial Flow (mgd)	Receiving Stream	Receiving Stream Flow: Average (cfs)	Receiving Stream Flow: 7 day,10 yr. (cfs)
Clairton-Pittsburgh	19A, 19C	43	Penna. Ind. Chem. Corp/ Hercules Inc. Clairton Works/ U.S. Steel Corp. Irvin Plant/ U.S. Steel Corp. National Plant/ U.S. Steel Corp. Duquesne Plant/ U.S. Steel Corp. Edgar-Thompson Plant/ U.S. Steel Corp. Westinghouse Elec. Corp. Carrie Furnace Plant/ U.S. Steel Corp. Homestead Plant/ U.S. Steel Corp. Pittsburgh Works/ Jones & Laughlin Steel	1,246	Monongahela River	12,200	1,197
New Kensington-Pittsburgh	18A	50	Allegheny Ludlum Steel Corp. PPG Glass Research Center Alcoa Research Lab	116	Allegheny River	19,030	3,798
Pittsburgh-Leetsdale	20G	28	Russell Burdsal & Ward Vulcan Detinning/ Vulcan Materials Co. Shenango, Inc. Mayco Co. & Chemical Co. USS Chemicals/ U.S. Steel Corp.	41	Ohio River	32,530	5,500
Bridgeville-Carnegie	20F	15	Specialty Steel Div./ Universal Cyclops Corp. St. Regis Paper Teledyne Col. Summerhill	4	Chartiers Creek	384*	6.21

TABLE 2.1.6.-46 (Continued)

Area	COWAMP Sub-Basin	Total No. Industrial Facilities	Facilities with Severe Impact	Total Industrial Flow (mgd)	Receiving Stream	Receiving Stream Flow Average (cfs)	Receiving Stream Flow 7 day,10 yr. (cfs)
Kittanning-Ford City	17E	9	Ford City Works/ PPG Industries, Inc. Linde Division/ Union Carbide Corp.	74	Allegheny River	15,460	1,550
Vandergrift	18B	11	Parks Twp. Plant/ Nuclear Mat. & Equi. Co. Altmire Coal Apollo Plant/ Nuclear Mat.& Equip. Co. Vandergrift Plant/ U.S. Steel Corp. West Leechburg Plant/ Ally. Ludlum Steel, Inc.	7	Kiskiminetas River	3,051	488
Aliquippa-Rochester	20G	20	Aliquippa Works/ Jones & Laughlin Steel Armco Steel Corp. Wyckoff-Steel Div./ Ampco Pittsburgh Corp. Valvoline Oil/Ashland Oil & Refining Co. Pittsburgh Tube Co. Colonial Steel Div./ Vasco Teledyne Zinc Smelting Div./ St. Joe Minerals	424	Ohio River	32,680**	5,505
Beaver Falls-Beaver	20B	16	Tubular Prod. Div./ Babcock & Wilcox Co.	10	Beaver River	3,379	522
Butler	20C	11	Butler Works/ Armco Steel Corp.	6	Connoquenessing River	161**	40
Washington	20F	12	Jessop Steel Co./ Athalone Corp. Washington Steel Co.	3	Chartiers Creek	32.7*	0.69

TABLE 2.1.6.-46 (Continued)

Area	COWAMP Sub-Basin	Total No. Industrial Facilities	Facilities with Severe Impact	Total Industrial Flow (mgd)	Receiving Stream	Receiving Stream Flow Average (cfs)	Receiving Stream Flow 7 day,10 yr. (cfs)
Monongahela-California	19C	20	Allenport Plant/ Wheeling-Pgh. Steel Co. Page Fence Divsion/ American Chain & Cable Monessen Works/ Wheeling-Pgh. Steel Co. Newal Plant/ Allied Chemical Corp.	103	Monongahela River	8,758	907

* Calendar year 1972.

** Estimated drainage and flow at Sewickley gaging station.

details of the receiving stream are listed.

The industrial direct stream discharges are summarized by Major SIC groups in Table 2.1.6.-47 for Study Area #9 and in Table 2.1.6.-48 for Study Area #8. The industry type, its Major SIC Group number, a potential water quality impact rating assigned to the group, and the total wastewater flow is given in the tables.

The total industrial direct discharge in the two COWAMP Study Areas is 244.8 mgd. By far the largest source is the primary metals industry (SIC Major Group 33) with a total flow of 2077 mgd, which comprises approximately 84.9% of the total industrial discharge. Second largest is the chemicals and allied products industry (SIC Major Group 28) with 201 mgd discharge comprising 8.2% of the total.

An account of industrial discharges by county was written in the COWAMP Reports (2) and (1), and this is reproduced below for Area #9 and #8 counties in the ORBES Region.

COWAMP AREA #9

Allegheny County has the largest concentrations of industrial discharges in the study area. Over 150 industrial facilities discharge wastewaters directly into streams in the county. (Another 250 major industries discharge wastewaters into ALCOSAN) ...Over half the industrial discharges are along the Allegheny, Monongahela, and Ohio Rivers. There are also a number along Chartiers Creek; the remainder are scattered throughout the county.

Along the Monongahela River, total industrial discharges are almost 2000 cfs, about one-sixth of the river's average flow and more than half the industrial flow in the study area. Most discharges emanate from steel plants. Industrial discharges to the Allegheny and Ohio Rivers in Allegheny County are large but do not compare with discharges to the Monongahela in terms of waste flows (see Table 2.1.6.-46). Nevertheless, some industries present hazards to water quality because of the characteristics

TABLE 2.1.6.-47

INDUSTRIAL DIRECT STREAM DISCHARGE SUMMARY BY MAJOR SIC GROUPS
COWAMP AREA #9

Source (2)

Major SIC Group	Rating*	Industry	Number	Total Flow (mgd)	% Total S.A. Flow
01-02	C	Agriculture	4	0.005	0.1
12	A	Coal Processing	56	16.3	0.7
13	C	Natural Gas	1	0.013	0.1
14	C	Mineral Processing	22	3.3	0.1
15-17	C	Construction	10	0.00	0.1
20	A	Food Products	61	5.2	0.2
22	C	Textiles	1	0.010	0.1
24	C	Lumber and Wood	4	0.006	0.1
26	A	Paper Products	6	0.15	0.1
28	A	Chemicals and Allied Products	44	193.	8.6
29	A	Petroleum Refining	30	5.2	0.2
30	B	Rubber and Misc. Products	7	5.4	0.2
31	B	Leather Products	1	0.014	0.1
32	C	Stone, Clay, Glass, Concrete	61	14.4	0.6
33	A	Primary Metals	76	1971.	87.2
34	B	Fabricated Metals	52	15.9	0.7
35	B	Machinery-Nonelectric	12	5.3	0.2
36	B	Machinery-Electric	18	8.14	0.4
37	C	Transportation Equipment	4	0.56	0.1
38	C	Instruments	6	0.17	0.1
40	C	Railroad Services	16	0.23	0.1
42	C	Motor Freight Services	5	0.007	0.1
44	C	Water Transportation Services	1	0.001	0.1
45	B	Air Transportation Services	2	0.058	0.1
46	C	Pipe Lines	3	0.300	0.1
49	C	Utilities	4	0.246	0.1
50	B	Wholesale Trade	3	0.109	0.1
51	C	Petroleum Bulk Stations	11	0.934	0.1
65	C	Commercial Buildings	1	13.5	0.6
72	A	Laundries	4	0.055	0.1
73	A	Laboratories	7	0.683	0.1
75	B	Automotive Services	17	0.065	0.1
		TOTALS	550	2260.	100.0

*Rating was assigned to each SIC Group based on the potential water quality impact of major pollutants associated with the type of industry in the group.

A - Serious potential water quality impact
B - Moderate potential water quality impact
C - Slight potential water quality impact

TABLE 2.1.6.-48

INDUSTRIAL DIRECT STREAM DISCHARGE SUMMARY BY MAJOR SIC GROUPS

COWAMP AREA #8

Source (1)

Major SIC Group	Rating*	Industry	Number	Total Flow (mgd)	% Total Study Area Industrial Flow
09	C	Fish Hatcheries	3	8.56	4.5
12	A	Coal Processing	10	0.73	0.4
14	C	Non-Metalic Mineral Proc.	24	15.11	8.0
20	A	Food Products	8	0.15	0.1
24	C	Lumber and Wood	1	0.02	0.1
25	C	Furniture	1	0.0	
26	A	Paper Products	1	13.05	6.9
28	A	Chemicals and Allied Products	8	8.01	4.2
29	A	Petroleum Refining	9	25.14	13.3
30	B	Rubber and Misc. Products	6	2.14	1.1
31	B	Leather Products	1	0.03	0.1
32	C	Stone, Clay, Glass, Concrete	19	4.00	2.1
33	A	Primary Metals	24	106.47	56.5
34	B	Fabricated Metals	15	1.44	0.8
35	B	Non-Electric Machinery	17	0.34	0.2
36	B	Electric Machinery	11	1.30	0.7
37	C	Transportation Equipment	9	1.67	0.9
38	C	Instruments	1	0.03	0.1
39	C	Misc. Manufacturing	1	0.16	0.1
40	B	Railroad Services	3	0.02	0.1
42	C	Motor Freight	2	0.002	0.1
49	C	Utilities	2	0.002	0.1
72	A	Laundries	3	0.02	0.1
75	B	Automotive Services	2	0.001	0.1
		TOTALS	171	188.40	100.0

*Rating was assigned to each SIC Group based on the potential water quality impact of major pollutants associated with the type of industry in the group.

A - Serious potential water quality impact
B - Moderate potential water quality impact
C - Slight potential water quality impact

of the discharges. Discharges to Chartiers Creek are not particularly large in terms of flow, but represent a significant fraction of the low flow in the creek. Industrial discharges to small streams in the area present problems only during low flow events.

Four power generating facilities in the county use once-through waste heat cooling...Two facilities on the Allegheny River discharge 620 mgd (approximately 3.1 billion BTU's/hr.); there is a 507 mgd discharge to the Monongahela (BTU not given) and a 231 mgd discharge to the Ohio (approximately 1.7 BTU's/hr.). Industrial cooling water adds to the temperature effect from power generating facility discharges; but the additional heat is not significant in relation to the output from the generating facilities except in the Monongahela, where over half the industrial discharge is some form of cooling water.

Of the major rivers, the Monongahela experiences the most problems from industrial wastes with excessive loads of phenols, iron, oil, suspended solids, and occasional problems from thermal discharges. In December 1974, hundreds of complaints were made about bad drinking water in the South Hills area of Pittsburgh. The problem was caused by high levels of phenols in the Western Pennsylvania Water Company water supply, which is drawn from the Monongahela. The high phenol concentrations were attributed to U. S. Steel and Pennsylvania Industrial Chemical Corporation discharges. The Allegheny River has fewer water quality problems from industrial wastes, but has experienced fish kills from industrial operations. The Ohio River, affected by the pollutant load carried by its tributaries and by industrial plants on the main stem, has high phenol levels. Of the smaller streams in the area, Chartiers Creek and Pine Creek have problems caused by industrial wastes; although Pine Creek has only a few industrial discharges, their volume and waste load is large relative to the small flow in the stream. In addition to the above streams, fish kills attributed to industrial sources have occurred on Bull and Blockhouse Creeks.

Industrial discharges in Armstrong County are centered in two areas, the Kittanning-Ford City area on the Allegheny and the Vandergrift area on the Kiskiminetas River. The latter area is discussed under Westmoreland County. Only a few other discharges are scattered throughout the rest of the county; of these, only coal washeries...have a significant impact on stream quality. The one major industrial discharge to a municipal facility causes no problems. In the Kittanning-Ford City area, 9 industries discharge 73.653 mgd to the Allegheny River, with the Linde Division of Union Carbide contributing 72 mgd. Armstrong Electric

Generating Station at Reasedale on the Allegheny discharges 196 mgd of waste heat cooling water (approximately 1.8 billion BTU's/hr.).

Discharges into the Allegheny probably add to the gradual deterioration in water quality of the river as it flows southward, but the Allegheny remains in good condition above its confluence with the Kiskiminetas.

Beaver County has heavy concentrations of industrial discharges along the Ohio and Beaver Rivers, but few other industrial facilities. In the Beaver Falls-Beaver area, 16 industries discharge about 10 mgd into the Beaver River. Twenty industries discharge more than 400 mgd to the Ohio River in the Aliquippa-Rochester area. Two other large discharges are the 105 mgd Arco Polymer discharge to Raccoon Creek at its confluence with the Ohio and the 8 mgd wastewater flow from the Tubular Products Division of Babcock and Wilcox Company into the Beaver River above Beaver Falls. A nuclear power generating facility at Shippingport discharges 165 mgd of cooling water to the Ohio (approximately 0.53 billion BTU's/hr.).

The Beaver River already is polluted when it enters Beaver County; the industrial discharges in Beaver County add to the pollutant load but are not the major cause of its relatively poor water quality. The discharges to the Ohio are large even in relation to the flow in the Ohio and, combined with the pollutant load carried by the Beaver, cause excessive concentrations of heavy metals, cyanide, and phenols in the Ohio. Connoquenessing Creek shows pollution from industrial waste sources outside Beaver County.

Butler County does not have the high concentrations of industrial waste discharges found in other counties, but does have water quality problems from industrial wastes because receiving streams for major discharges are rather small. The Butler area has the largest concentrations of industrial discharges, with about 6.4 mgd flowing into Connoquenessing Creek, which has an average flow of only slightly over 100 mgd. There are a number of industrial discharges scattered along Glade Run, Breakneck Creek, Slippery Rock Creek, and the South Bear Creek. There are additional discharges on the Connoquenessing in the Zelienople area.

The Connequenessing has relatively severe water quality problems resulting from industrial wastes, largely from Armco Steel in Butler, although the other discharges contribute to the problem. Glade Run has high heavy metal concentrations but is in good shape biologically. Breakneck Creek experiences periodic problems with industrial spills. The south branch of Bear Creek is severely depressed by refinery wastes. Fish kills have occurred in all of the above streams, and one kill in Slippery Rock was attributed to an industrial discharge.

Fayette County is not heavily industrialized, having a number of industries in a broad area between Uniontown and Connellsville and several more scattered along the Monongahela River and Jacobs Creek. The major industrial dischargers are Allied Chemical in Newell on the

Monongahela and Anchor Hocking in South Connellsville on the Youghiogheny. The Newell plant - 7.92 mgd - is considered as part of the Monongahela-California area and is discussed under Washington County. The Anchor Hocking plant flow, 0.81 mgd, is small in comparison to the 2500 cfs flow in Youghiogheny; consequently, smaller discharges on Jacobs Creek and the small creeks in the Uniontown-California area have more impact. One such plant is Joseph Packing, which has a high BOD effluent discharged to Opossum Run about one mile above its confluence withe the Youghiogheny. Several small plants discharge to Redstone Creek and its tributaries, and there are a relatively large number of industrial discharges to municipal treatment plants in the Uniontown area; many of these municipal facilities provide less than secondary treatment.

Redstone Creek has significant problems from industrial wastes, particularly phenol and heavy metals. The Youghiogheny River is in good condition but does have high concentrations of aluminum and occasional high phenol levels. Jacobs Creek has high levels of zinc, but discharges in Westmoreland County probably are more responsible than the few in Fayette County.

Greene County, the least industrialized county in the study area, has only 10 industrial discharges directly into the streams and only 1 discharge to a municipal treatment facility. The discharges are not concentrated in any one area but are scattered along the Monongahela River and Tenmile Creek. The only major discharge is a coal washery, discussed in the mineral extraction section. An electric generating station on the Monongahela River opposite Masontown discharges 732 mgd of waste heat cooling water to the Monongahela (approximately 4.5 billion BTU's/hr.).

South Fork Tenmile Creek, because of its small size, does have some problems with industrial wastes even though there are only a few small discharges. Dunkard Creek is depressed due to industrial wastes near its mouth; the sampling station on Dunkard Creek shows high levels of nickel in addition to other constituents normally associated with acid mine drainage, but no industrial discharges on the lower reaches of Dunkard Creek are listed in the NPDES permit files. The Monongahela River is affected by industrial pollution, but major sources are in West Virginia; it is not until the Monongahela-California area that heavy industrial discharges occur.

Indiana County is lightly industrialized, with several industries concentrated in the Indiana - Homer City area on Two Lick and Yellow Creeks and the other discharges scattered throughout the county. The most significant discharge is that of the McCreary Tire Company, with a flow of 3.91 mgd to White Run, a tributary of Two Lick Creek. Several other discharges to Two Lick Creek and its tributaries in the Clymer area make this stream the most heavily affected by industrial discharges originating in Indiana County. The Conemaugh River is depressed by industrial wastes, but most of the impact comes from outside the study area.

Washington County has industrial discharges scattered throughout the area; the greatest concentrations occur in the Washington area, Canonsburg area, and Monongahela-California area on the Monongahela River. The first and last areas are included in Table 2.1.6.-46. The Monongahela area is more notable in terms of industrial flow - over 100 mgd - but in the Washington area there is a greater impact on water quality because the receiving stream, Chartiers Creek, is rather small in that area. Discharges to Chartiers Creek in the Canonsburg area add to the problem. Almost all industrial connections to municipal facilities are also in the above three areas. Industrial discharges outside the three areas are small except for a coal washery on Pigeon Creek. An electric generating facility on the Monongahela at Courtney discharges 453 mgd of cooling water (approximately 2.4 billion BTU's/hr.).

Chartiers Creek has very poor water quality, largely due to acid mine drainage and municipal discharges. Industrial discharges add to the pollutant load. Discharges to the Monongahela River in Washington County are significant because the river has little time to recover before encountering the heavy concentration industrial discharges to Allegheny County.

Westmoreland County is second to Allegheny County in number of industrial discharges, but ranks below Beaver in total flow. The large number of discharges to small streams creates several potential problem areas. Concentrations of industries occur in the Monessen area (part of the Monongahela-California area); in the Vandergrift area on the Kiskiminetas River, where 11 industries discharge 7.4 mgd; in the Greensburg area on Jack's Run, where the industrial flow is 2.2 mgd; in the Jeannette area on Brush Creek, where the industrial flow is 2 mgd; and in the Latrobe area on Loyalhanna Creek, where a total of slightly less than 0.9 mgd is discharged from 9 industrial facilities. Five of the industries in the Vandergrift area and 2 industries in the Latrobe area (see Table 2.1.6.-46) are considered to have potentially severe impacts on water quality. A power generating facility on the Conemaugh River at Hooverville discharges 260 mgd of cooling water (approximately 1.28 billion BTU's/hr.). Other discharges are scattered throughout the county, with numerous discharges in the southwestern portion of the county along Sewickley and Jacobs Creeks and their tributaries. The eastern part of the county is relatively free of industrial discharges.

As previously mentioned, the Conemaugh River already is polluted when it enters the study area. Except for thermal problems from the power generating station, little additional pollution is added to the Conemaugh before its confluence with Loyalhanna Creek to form the Kiskiminetas River. Loyalhanna Creek, however, is affected by industrial wastes, although it has recovered substantially by the time it joins the Conemaugh. Industries in the Vandergrift area make a significant contribution to the pollutant load carried by the Kiskiminetas. Jacobs Creek is in relatively good condition. Sewickley Creek is severely affected by acid mine drainage so that the impact from industrial wastes is difficult to determine. There is little information on Jack's Run and Brush Creek, but the large size of the discharges relative to the small creek flows indicates that careful control of waste discharges in the Greensburg and

Jeannette areas must be exercised to prevent degrading water quality of the streams.

COWAMP AREA #8

There are only a few industrial discharges scattered throughout Clarion County. Of the major discharges, the Glass Container Corporation's cooling water discharge probably is the most significant - the flow is small (o.157 mgd) but the receiving stream (Canoe Creek [17B]) also is small. Water from coal washeries also may cause problems in Clarion and other counties, but this is discussed in the section on acid mine drainage. The sampling stations on the Clarion River in Clarion County (WQN Stations 821 and 843) show high concentrations of manganese and zinc - this may be due in part to acid mine drainage.

Elk County does not have as many industrial discharges as some of the more urbanized counties but, nevertheless, has several problem areas from industrial wastes. There are five industrial facilities with a total flow of over 1.4 mgd in St. Marys, where the average flow in Elk Creek (17A) is only about 20 cfs (13 mgd). Much of the waste flow is from carbon companies and has high heavy metal concentrations. Several chemical company discharges occur in Ridgway, at the confluence of Elk Creek and the Clarion River (17A). Several fish kills have occurred in this area, attributed to chemicals and metals from industrial operations. However, the WQN sampling station on Elk Creek (844) does not show particularly high levels of heavy metals and the fish kills probably represent spill events or periodic discharges rather than continuous discharges. The largest industrial discharge in Elk County is Penntech Paper, located on Riley Run, a tributary of the Clarion River near Johnsonburg (17A). The large flow (13 mgd) and high BOD loading of the wastes cause Riley Run to be severely depressed and cause occasional low dissolved oxygen levels in Clarion River.

Forest County has only three industrial discharges, none of which has a major impact on water quality.

Jefferson County also has very few industrial discharges. None has major impacts on water quality other than the concentration of plating industries in Punxsutawney which causes problems with the sewage treatment plant and may be responsible for several fish kills in Mahoning Creek at Punxsutawney (17B).

Lawrence County is one of the urban and industrial centers of the study area, with a large concentration of industries in the New Castle area and many other industrial facilities scattered throughout the county. In the New Castle area, 11 facilities contribute 1.87 mgd of wastewater to the Shenango River (20A) and nearby tributaries. Only one of these facilities, Rare Earth, Inc., is listed as having a severe impact on water quality. Other major facilities in the county are the U. S. Steel facility at Ellwood City on Connoquenessing

Creek (20C), which, with a flow of 5.73 mgd carrying several pollutants including BOD, has a potentially severe impact on water quality. There are two major discharges from limestone companies; these are discussed in the mineral extration section. Of the streams in the county, the Mahoning River (20B) has serious water quality problems due to both industrial and domestic wastes, but most of the waste stems from the Youngstown-Struthers-Gerard area in northeastern Ohio. The pollutant load from the Mahoning seriously affects quality of the Beaver River (20B), formed by the confluence of the Shenango and Mahoning Rivers just below New Castle, so that the effect of the industries in the New Castle area and the effect of the U. S. Steel plant is difficult to determine.

Mercer is the most heavily industrialized county in the study area, with most of the discharges occurring along the Shenango River (20A). Six industrial facilities contribute 0.703 mgd to the Shenango at Greenville. One of these facilities, Damascus Tube/Sharon Steel, has a potentially severe impact on water quality from heavy metals. In the Sharon-Farrell area, 9 industries have a total waste flow of 92.143 mgd. Almost all of this flow is from one industrial source - the 87.56 mgd from Sharon Steel, by far the largest single industrial waste flow in the study area. Slightly over 20 mgd of this flow is cooling water and is relatively clean, although the temperature is 28° C. The rest of the flow is process water, containing a number of pollutants... The high heavy metal concentrations found in the Shenango River in Mercer County probably are attributable largely to this plant since there is no appreciable acid mine drainage, although contributions from other plants in the area are not inconsiderable, notably from the Sawhill Tubular Pipe Plant. Several fish kills have occurred in the Sharon area, but not particularly severe ones; apart from the heavy metals and high nutrient levels probably caused by municipal wastes, the Shenango River is in fairly good condition, indicating that even very large flows of industrial wastes will not impair water quality if proper control measures are taken (e.g., for heavy metals).

Venango County has a heavy industrial concentration in the Oil City-Franklin area with only a few industrial waste discharges elsewhere in the county. Seventeen industries discharge 5.5438 mgd of industrial wastewater into the Allegheny River and its tributaries in the Oil City-Franklin region (16D, G, E). Of the streams in the area, Oil Creek (16E) is the most severely affected. Oil Creek is in excellent condition throughout most of its length, but the last two miles before its confluence with the Allegheny have poor conditions from oil pollution and related petroleum activities. French Creek (16D) actually receives more waste flow, including the 3.11 mgd flow from the Franklin Steel Division of Borg Warner. Fish kills have been recorded in both French and Oil Creeks, but not in the Allegheny itself - apparantly the large, relatively clean flow of the Allegheny is enough to dilute the effect of the industrial wastes. Another major industrial waste discharge occurs at Emlenton, where the Quaker State Oil Refinery has a 5.25 mgd discharge into the Allegheny. This discharge is listed as potentially severe, but no data exist to indicate adverse effects on the Allegheny.

2.1.6.6. ACID MINE DRAINAGE AND CONTROL

A. Introduction

The effect of acid mine drainage on streams is the single most severe water quality problem in western Pennsylvania. Acid mine drainage can occur in association with several types of mining, e.g., copper, gold, zinc and sulfur (41) but predominantly it is a problem of the coal mining industry. Chemically it can be described as the effluent originating from a coal seam and containing (3) (42) (43):

· Low	pH	-log (H+ Conc)	2 - 6
· High	acidity	Titratable acid	Over 2,000 milligrams per liter
· High	ferrous iron	(Fe^{2+})	10 - 3,000 milligrams per liter
· High	total iron	(Fe^{2+} + Fe^{3+})	0 - 9,300 milligrams per liter
· High	sulfate	(SO_4^{--})	22 - 9,700 milligrams per liter
· High	aluminum	(Al^{3+})	0.1 - 530 milligrams per liter
· High	manganese	(Mn ions)	0.04 - 127 milligrams per liter
· Low	bicarbonate	(HCO_3^-)	0 - ? milligrams per liter
· Low	alkalinity	Titratable base	0 - 720 milligrams per liter
· High	hardness	($CaCO_3$)	Over 1,000 milligrams per liter

To the eye, acid mine drainage is indicated by a reddish-yellow scum called "yellowboy" which stains the beds of streams. The water becomes toxic to fish, irritates the eyes and skin of those that use the rivers for recreation, and is unsuitable for drinking.

The origin of acid mine drainage is pyritic (iron sulfide) material occurring in the coal bearing strata. If left to erode naturally this material would oxidize slowly and only slight natural acid drainage would be detectible in streams. In fact, the natural occurrence of yellowboy was used by early coal explorers to locate buried coal seams (3). However, the importance of coal to the economy over the past 200 years has meant extensive mining, and large quantities of pyrite overburden have been disturbed and exposed to the air. Oxidation of the exposed pyrite has taken place at an accelerated pace and outstripped the capacity of the environment to assimilate the acid drainage through the neutralizing effect of limestone and dolomite occurring within the coal-bearing formations. Although only about half of the coal mines in western Pennsylvania have a mine discharge which is acid by EPA standards ($pH < 6$) (44), the result has been a severe degradation of the quality of the streams in producing areas - a degradation that has followed America's search for coal even up to this decade.

Currently the coal industry is undergoing a rebirth after half a century of decline. Coal production in 1978 has regained the production level of 1913 (45) but this time it has a more sophisticated technology and is the focus of a national energy plan. To trace the rise and fall of coal before this latest resurgence, let us go back to the beginning of the United States as a country, before the Revolution:

> The earliest recorded coal mining in the United States occurred in 1701, near Richmond, Virginia, but commercial mining of coal did not begin in this country until 1745. Coal was discovered in Ohio in 1755...(46).
>
> There was no other important production until 1759 when a coal mine was opened on the Monongahela River opposite Fort Pitt, now Pittsburgh (47).
>
> In 1770 George Washington commented on an Ohio Coal mine he had seen. Yet with concentrated deposits of coal available for exploitation, at presumably very low cost, coal still did not make significant inroads into the market for fuels. In fact, even with American deposits of coal having been identified, most of the coal used in America up until the Revolution was imported from England or Newfoundland. The shortage of coal occasioned by the break with England spurred the growth of American coal mining during the Revolution. Government requisitions of coal in Pennsylvania and

Maryland, to support the manufacture of munitions, stimulated the beginning of American coal mining as an industry. Thus the industry began, not as a natural response to price but as the result of a shock - the loss of English coal during the Revolutionary War.

A great discovery of coal was made in 1810 when an unusually violent freshet unearthed a huge coal seam, now believed to have been the Pittsburgh seam, near the town of Barton (Ohio). Coal from this seam was hauled by wagon as far east as Romney (West Virginia) and Winchester (Virginia). Later it was hauled overland to Westernport (Maryland) where it was placed on barges and rafts and shipped to Washington (D.C.). Yet, even with these early discoveries of coal in rich deposits, where fuel could be picked from the surface of the ground, coal production did not make significant inroads in the market for fuels (46).

In 1793 the United States produced about 63,000 tons of coal which was mined mainly in Pennsylvania and West Virginia (47).

It was not until 1850 that coal production reached 10 percent of the fuel provided by firewood (46).

Beginning in the mid 1850's the use of coal as an industrial fuel grew rapidly. In 1840, when the first Federal census was taken, coal production was approximately 2,000,000 tons. From 1841 to 1869 annual production grew to about 15,000,000 tons (47).

By 1885 coal production surpassed firewood production and continued to grow vigorously (46).

In the period, roughly 1890 to 1920, coal mining was one of the Nation's most rapidly growing industries. Production approximately doubled every 8 to 10 years but following the first World War peak, reached in 1918, the general long time trend has been downward... In 1900 coal contributed 89 percent of the energy derived from the mineral fuels (coal, oil and gas) and water power. By 1937 this had dropped to 54 percent. Natural gas and petroleum contributed 43 percent and water power 3 percent (47).

In about 1920, the production of oil and natural gas, and their use as industrial fuels began a growth that ultimately exceeded even the previous growth in the use of coal. As coal had replaced wood as the principal industrial fuel, so oil and gas came to replace coal (46).

A dramatic turn in the development of coal took place in 1973-74 when the oil embargo was imposed on the United States of America. By this time the contribution from coal to the United States energy consumption had dropped to 19 percent and was overshadowed by natural gas and petroleum which had risen to 75 percent (48). The effect of the embargo and other changes can be seen in the readjustment of energy sources in Pennsylvania between 1974 and 1975. The contribution from coal increased 2.1 percent and the hydro/nuclear contribution increased 2.8 percent, while petroleum and natural gas contributions dropped 2.7 percent and 1.3 percent respectively (49). Funds spent on coal research by the Federal government in 1974 were equivalent to the combined budgets of the previous 13 years for such research (45). In 1977 a major thrust back to coal commenced when President Carter took office with a proposed national energy plan to relieve United States dependence on foreign petroleum and natural gas. This was in the atmosphere of a renewed increase in national energy consumption after the temporary decline following the oil embargo and the economic recession (49).

Pennsylvania is particularly sensitive to a renewed emphasis on coal because of the large resources located in the state. However, it has been argued that the new thrust has done more to shift the energy source from natural gas to oil in 1977 than to coal.

> Industries experiencing plant closings because of wintertime gas cutoffs have switched in substantial numbers to fuel oil, propelling a 14.5 percent increase in the demand for residual oil (50).

On the other hand, as Charles Berg has pointed out, historically the change of a fuel source may have as much to do with increased opportunity to develop new and more productive processes, as with competitive cost (46). The inventive minds which have been attracted to coal as a "new energy source" are evidenced by their work in coal gasification and coal liquefaction. Scientists and engineers have also researched the pollution problems of coal as in the case of sulfur dioxide scrubbers and the treatment of mine drainage. The Research and Development budget for coal research within the Federal government has grown strongly since 1974 and has now reached half a billion dollars annually (45).

So the return to coal as a major source of energy may be the prospect for the close of the 20th century. Beyond is solar energy, wind and other renewable energy sources and perhaps a break with the traditional idea or a centralized energy distribution system. But for now the political and long-term economic forces are placing coal in the spotlight, including a focus on the environmental consequences of coal mining and conversion. Acid mine drainage along with sulfur dioxide emissions are front runners in that controversy.

B. History of Acid Mine Drainage and Control

1900 - 1940

The history of acid mine drainage closely paralleled that of the coal industry in the early years. Acid loads in the rivers increased in proportion to the cumulative tonnage of coal mined. For example, Figure 2.1.6.-33 shows the rise in acidity (methyl orange) levels in the Monongahela River in relation to the cumulative production of coal between 1917 and 1940.

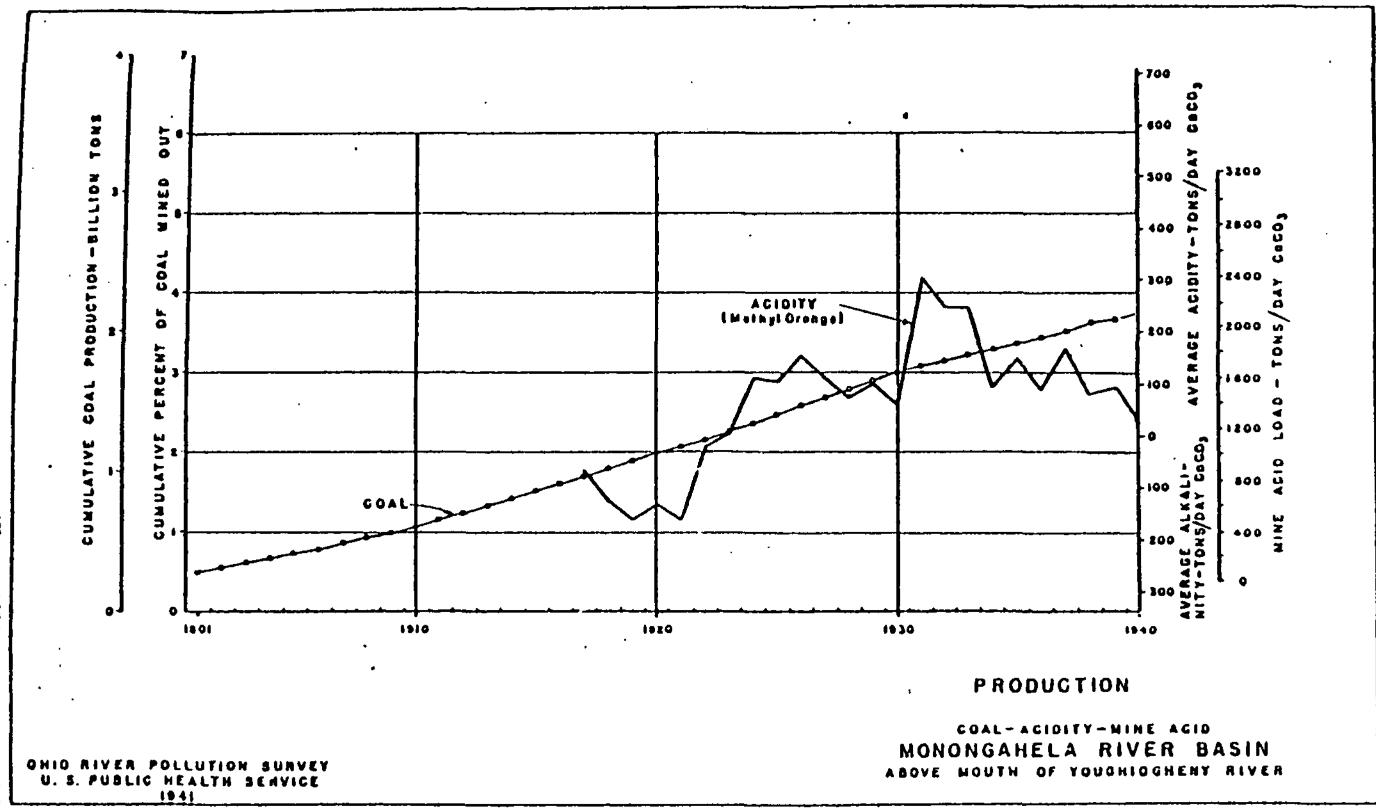
While it was no great problem in 1900, acid mine drainage made its presence felt by 1910. By 1920, the Kiskiminetas and Youghiogheny Rivers became acid and the upper Monongahela River was soon to follow. In the high-acid year, 1934, the Allegheny River, which at that time had a natural alkalinity of 25 parts per million, barely missed becoming acid in average quality (47). Figure 2.1.6.-34 shows the acidity in the Monongahela River from 1931-1947. The acidity (methyl orange) is expressed in milligrams per liter calcium carbonate equivalent (23). The Figure also illustrates the adrupt drop in acidity in the Monongahela River in 1939 when the Tygart Reservoir (in its headwaters) became operational.

Coal mines were responsible for 98% of the acid load discharged to streams in the upper Ohio River Basin in 1940. The balance originated from spent pickle

FIGURE 2.1.6.-33

COMPARISON OF CUMULATIVE COAL PRODUCTION AND FLUCTUATION IN MONONGAHELA RIVER ACID LEVELS: 1917-1940

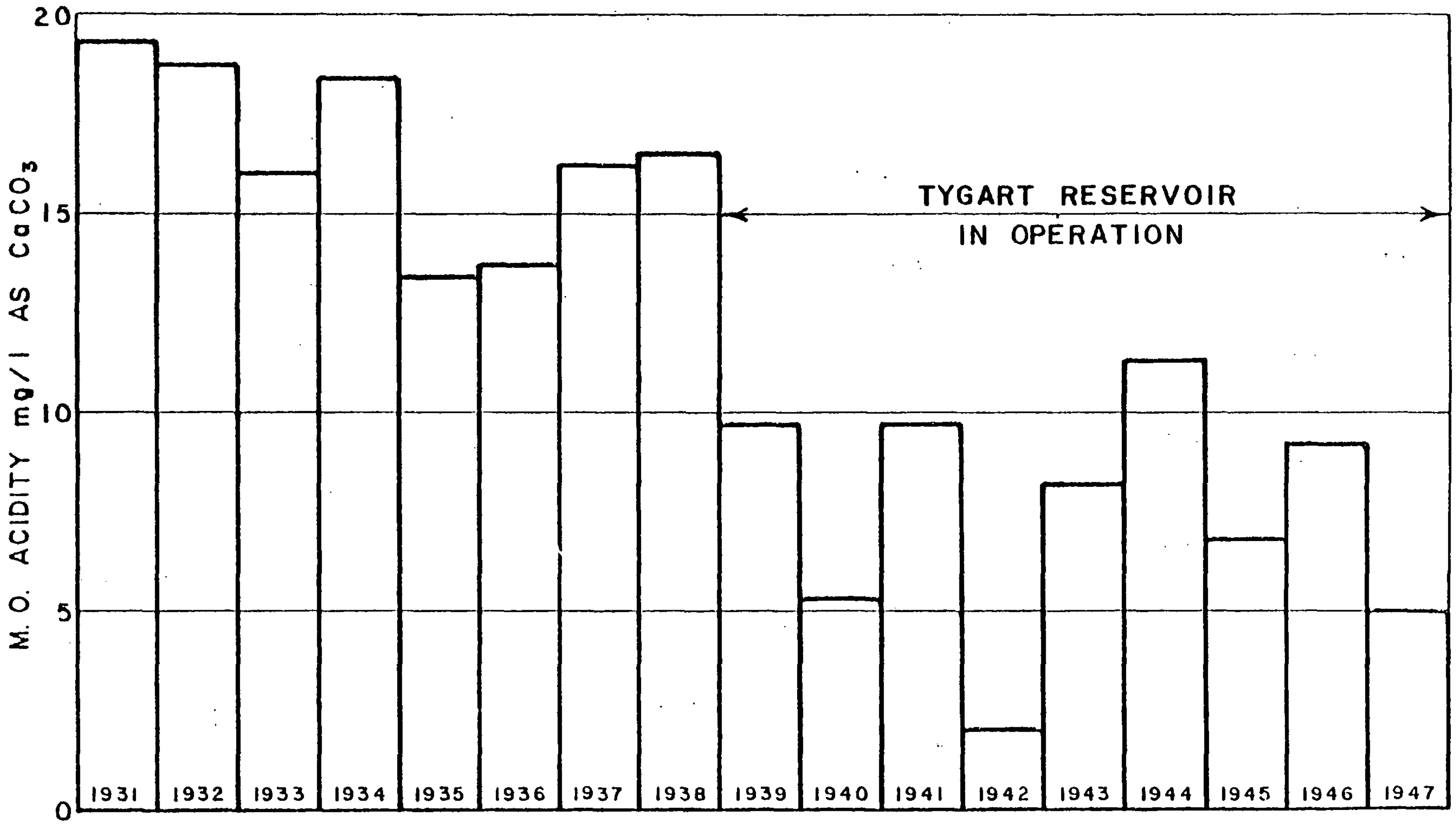
Source (47)



(Facing p. 1020) GPO 41 0-10035

Fig. Ac-12

FIGURE 2.1.6.-34 ACIDITY LEVELS IN THE MONONGAHELA RIVER: 1931-1947 Source (23)



MONONGAHELA RIVER ABOVE McKEESPORT, PA.

AVERAGE METHYL ORANGE ACIDITY (JUNE – NOVEMBER) liquor discharged by the metallurgical industry and natural contributions of humic acids from swamps. The heaviest concentrations of acid occurred in the Monongahela River and the Kiskiminetas River which had the distinction of being the most acid major Ohio tributary basin, and the most acid large stream respectively (47). Table 2.1.6.-49 shows the acid load in the upper Ohio Basin compared to the Ohio River itself. The bulk of the load came from mine discharge, some of which was removed by sealing of abandoned mines.

In general, pickle liquor was a minor source of acid compared to the acid mine drainage except in the case of the Beaver River, which flows through the steel industry complex in Youngstown, Ohio. Here pickle liquor was responsible for almost half of the acid load discharged into the water. Along the Ohio mainstem the contribution from this source was under 9% and in the Allegheny and Monongahela Rivers it was about 1%.

Abandoned mines were a very significant source of the mine acid load in 1940. Table 2.1.6.-50 shows the contribution from abandoned mines in the major streams of the Upper Ohio Basin. It also indicates the reduction of acid load made possible by the sealing of some of the abandoned mines.

Abandoned mines were responsible for more than half of the mine acid load in the upper Allegheny and Beaver Rivers, about one-third in the upper Monongahela, and about one-quarter of the load in the Kiskiminetas and Youghiogheny tributaries. Active mines were the source of the balance of the load. The sealing program

TABLE 2.1.6.-49

1940 ACID LOADS IN THE UPPER OHIO BASIN
COMPARED TO THE OHIO RIVER MAINSTEM

After Source (47)

River	Original Mine Acid Load	Removal By Sealing	Residual Mine Acid Load	Pickle Liquor Acid Load	Total Acid Load	Mine Contribution By River
	Tons per Year (as $CaCO_3$)					Percent*
Allegheny	405,150	29,704	375,446	3,375	378,821	34.9
Monongahela	920,656	274,642	646,014	7,125	653,139	60.0
Beaver	17,388	2,280	15,108	8,000	23,108	1.4
Ohio in PA	49,397	9,030	40,367	5,840	46,207	3.7
Total Upper Ohio Basin**	1,392,591	315,656	1,076,935	24,340	1,101,275	100.0
Ohio Mainstem***	230,430	53,966	176,464	15,000	191,464	-

*Contribution from residual acid mine load expressed as a percentage of the total residual load upstream of the Pennsylvania/Ohio/West Virginia border.

**Upstream of the Pennsylvania/Ohio/West Virginia border.

***Minor tributaries and direct drainage of entire mainstem.

TABLE 2.1.6.-50

ABANDONED MINE ACID LOAD AND REMOVAL (IN 1940)
DUE TO SEALING PROGRAMS IN THE UPPER OHIO RIVER BASIN

After Source (47)

River	Original Mine Acid Load	Abandoned Mine Load		Removal By Sealing	
	Tons/Yr*	Tons/Yr*	%	Tons/Yr*	%
Allegheny - except Kiskiminetas	83,461	50,244	60	18,750	22
Kiskiminetas	321,689	73,988	23	10,954	3
Monongahela - except Youghiogheny	700,972	223,634	32	251,900	36
Youghiogheny	219,684	52,340	24	22,742	10
Beaver	17,388	10,920	63	2,280	13

*As $CaCO_3$

could be regarded as successful in the upper Monongahela, where the reduction matched the contribution from abandoned mines. Elsewhere the removal was significantly out of pace with abandoned mine drainage, especially in the Kiskiminetas River.

The remedial measures used around 1940 were mine sealing and flow regulation by reservoirs. Field studies were started in 1925 by the Bureau of Mines to find the means to prevent acid formation by sealing abandoned mines. Large scale sealing commenced in 1933, based on the principle of excluding air to prevent oxidation of the pyrite, marcasite and other sources of sulfur, occurring in association with coal seams. In addition, surface water was diverted from entering the mines through cracks or caves. Burke and Downs (47) proposed the reaction responsible for acid mine drainage as:

$$2FeS_2 + 7O_2 + 2H_2O = 2FeSO_4 + 2H_2SO_4 \qquad \text{(Eq. 1)}$$

Pyrite + Oxygen + Water ⟶ Iron Sulfate + Sulfuric Acid

The damage from the acid was assessed in terms of the cost of repairing corrosion of equipment on the rivers. Other consequences included the site suitability of food and textile industries, and the loss of aesthetic and recreational value of the river which, however, were not possible to be given a dollar value. Table 2.1.6.-51 demonstrates the cost due to acid mine drainage in terms of the damages that could be given a monetary value. It totalled over $2 million damage in Pennsylvania in 1940. By way of comparison $2,666,000 were spent up till that time on mine sealing in the Upper Ohio River Basin by the Works Progress Administration (47).

TABLE 2.1.6.-51

1940 COST OF DAMAGE DUE TO ACID MINE DRAINAGE
IN THE UPPER OHIO RIVER BASIN*

Source (47)

Industry	1940 $ Per Year
Domestic Water Supplies	364,000
Industrial Water Supplies	407,000
Steamboats and Barges	1,143,000
Power Plants	76,000
River and Harbour Structures	76,000
Floating Plant	5,000
Total	$2,071,000

*Upstream of the Ohio-West Virginia-Pennsylvania border.

Cure rather than prevention was the methodology of the day. Power plants, for example, found it cheaper to repair and replace their equipment for $76,000 than to neutralize the cooling water for $261,000 per year. Neutralization at the source, using limestone at the mine, had been tried as early as 1914 when a coal company near Mount Pleasant, Pennsylvania set up a treatment plant (51). However, due to economic reasons, the practice of treating acid mine drainage did not gain acceptance until half a century later.

Pennsylvania and West Virginia were the biggest mine drainage problem areas in the Ohio basin, as can be seen on Figure 2.1.6.-35. The acid load from mines was approximately 1,400,000 tons per year, and after 23% was removed by sealing programs, over 1 million tons were actually discharged to the streams in the upper Ohio Basin in 1940 (47).

The major problem areas were the Kiskiminetas River and the upper Monongahela River. The Kiskiminetas was responsible for 83% of the Allegheny Basin mine acid load and recorded a minimum pH of 2.9 at its mouth in 1940. The lowest pH in the Kiskiminetas drainage area was pH 2.4 in Blacklick Creek. This was the lowest pH recorded for the Upper Ohio River Basin that year. A similarly low pH of 2.5 was recorded in the upper Monongahela drainage area at Cats Creek (Masontown, Pa.). The upper Monongahela River (above the Youghiogheny) contributed 70% of the Monongahela basin acid mine load and had an average pH of 4.2 in the mainstem.

The Ohio River itself showed worsening water quality due to acid mine drainage. Back in 1914 acid conditions had been occasionally observed downstream as far as Wheeling, West Virginia (River Mile 90). By 1940, acid mine drainage affected the Ohio as far west as the mouth of the Kanawha River (River Mile 266) (47). The upper 100 miles of the Ohio was acid for a considerable part of the time in 1940 because of mine drainage. The river had to assimilate a

FIGURE 2.1.6.-35 COMPARISON OF MINE ACID LOADS BY STATE IN THE OHIO RIVER BASIN IN 1940-Source (47)

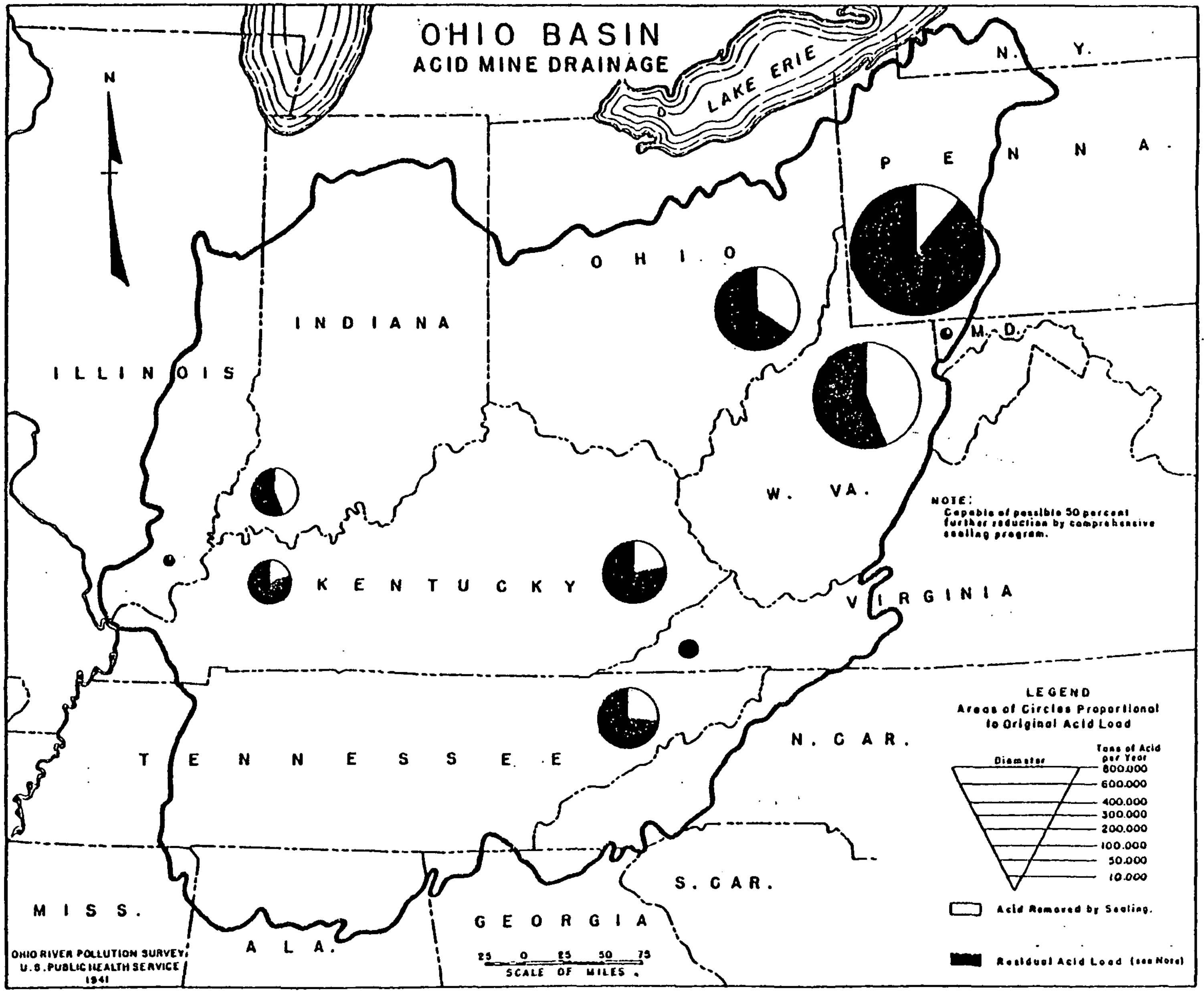


Fig. Ac-2

further 120,000 pounds per day of pickle liquor discharged by the 62 steel plants situated predominantly along this stretch (47).

1940 - 1960

The abatement of acid pollution lagged other pollution clean-ups because of the already acid condition of the streams and the depressed economy of coal mining regions. In 1947, 99% of the samples of the Kiskiminetas River contained free acid (pH < 4.5). This caused a drop in minimum pH in the Allegheny River from 6.5, above the mouth of the Kiskiminetas, to less than 5.6 for 45 days of that year, downstream of the mouth (30).

The Monongahela suffered a handicap in comparison to the Allegheny Basin. It does not have a high upstream alkalinity and the acid intensity (tons per square mile) at that time was about four times that of the Allegheny River (47). Consequently, pH levels upstream of the Youghiogheny River registered free acid for an average of 166 days per year during 1943-1949 (30). The Youghiogheny itself demonstrated free acid conditions about 50% of the time in 1947-48 at Sutersville (30).

The Beaver River was relatively dilute and free of acid because of the influence of the Mahoning and Shenango Rivers. However, although the water seldom dropped to free acid conditions, the high sulfate content indicated that interaction of sulfuric acid, from mine drainage, was taking place with bicarbonate in the river, and thereby depleting the Beaver's alkalinity (30).

The Pennsylvania program to regulate mining began in 1945 when discharge into unpolluted streams was prohibited (18). However, already polluted streams were exempted from this legislation and the control of existing operations was not attempted. This was due to the widely held belief that the control of acid mine drainage would be futile, until complete answers regarding the complex reactions involved had been developed through research. This attitude was so entrenched that in 1955, when ORSANCO (Ohio River Valley Sanitation Commission) adopted basic requirements for the control of industrial wastes, mine drainage was specifically exempted "until such time as practical means are available for control." (52)

1960's

Five years later (1960) ORSANCO removed the special exemption for acid mine drainage because the concept of ameliorating conditions by applying knowledge-at-hand gained acceptance (52). Monetary damage to industry and river structures during the early sixties in the Monongahela Basin alone was $2,251,000 annually (16). The standards for mine drainage and industrial acid and iron discharges were upgraded statewide in 1963.

A study undertaken in August of that year by the Public Health Service (16) showed that the Monongahela River acid loads were not significantly different from the 1940 loads with some values for 1963 exceeding those of 1940 and the reverse at other stations. The results of both the 1940 and the 1963 measurements are displayed in Figure 2.1.6.-36. The 1940 acidity is given at the side of each bar graph for 1963 acidity.

In the case of the Youghiogheny River there was a general improvement between the acid loads of 1940 and 1963. The Youghiogheny measurements are shown in Figure 2.1.6.-37. In Maryland the mainstem was alkaline but Laurel Run, an interstate tributary in the headwaters, was acid and caused a water supply problem for Oakland, Maryland. In Pennsylvania the mainstem was acid, but the loads were generally less than in 1940. However, the Sutersville station near the mouth of the Youghiogheny showed a triple increase in acid load. (This may have been due to the load from Sewickley Creek just upstream of the station.) The Casselman River was alkaline in its upper reaches but the stream deteriorated due to acid mine drainage in Pennsylvania.

FIGURE 2.1.6.-36

1963 ACIDITY AND ALKALINITY IN THE MONONGAHELA RIVER

- - -

1940 ACIDITY COMPARISON

Source (16)

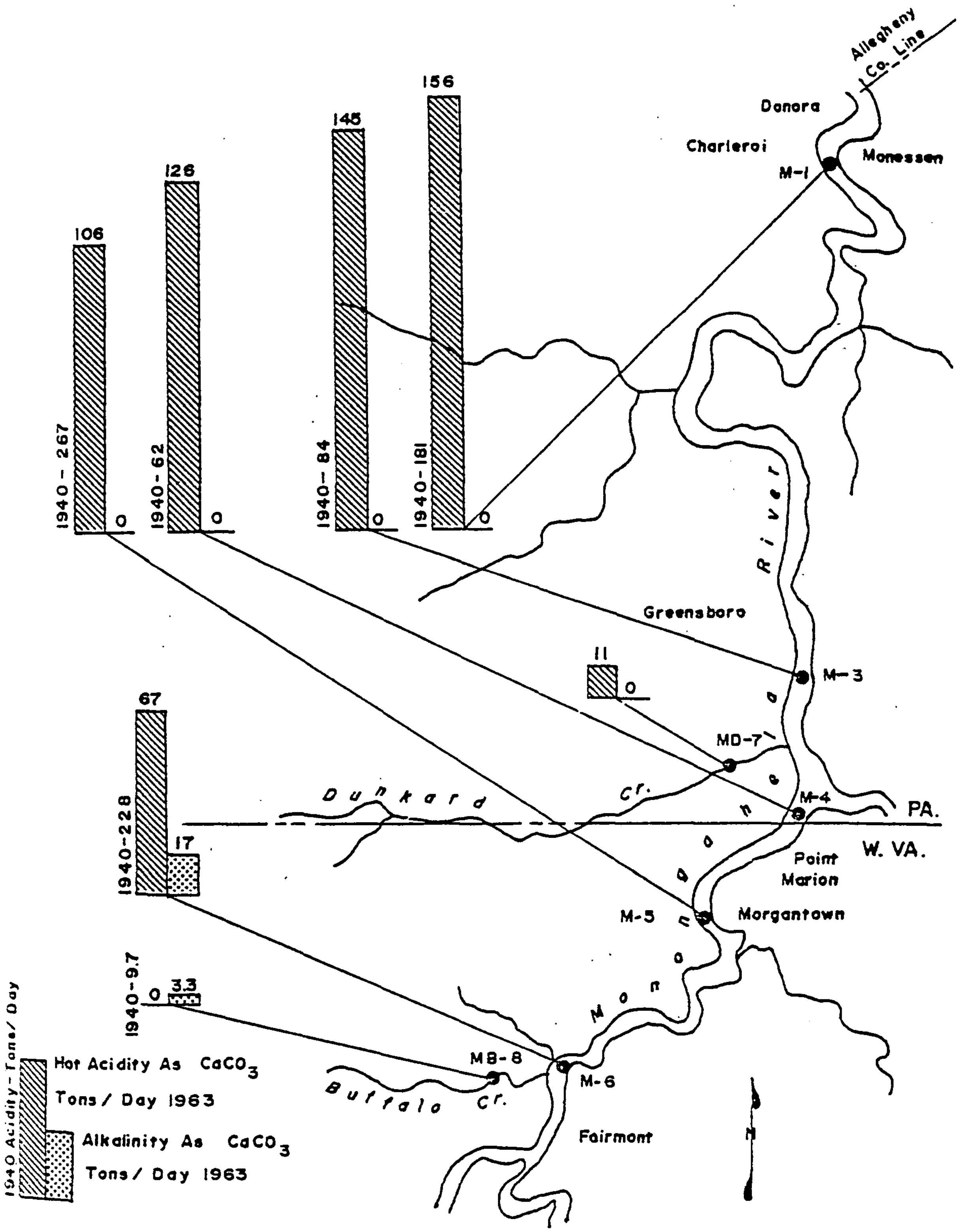


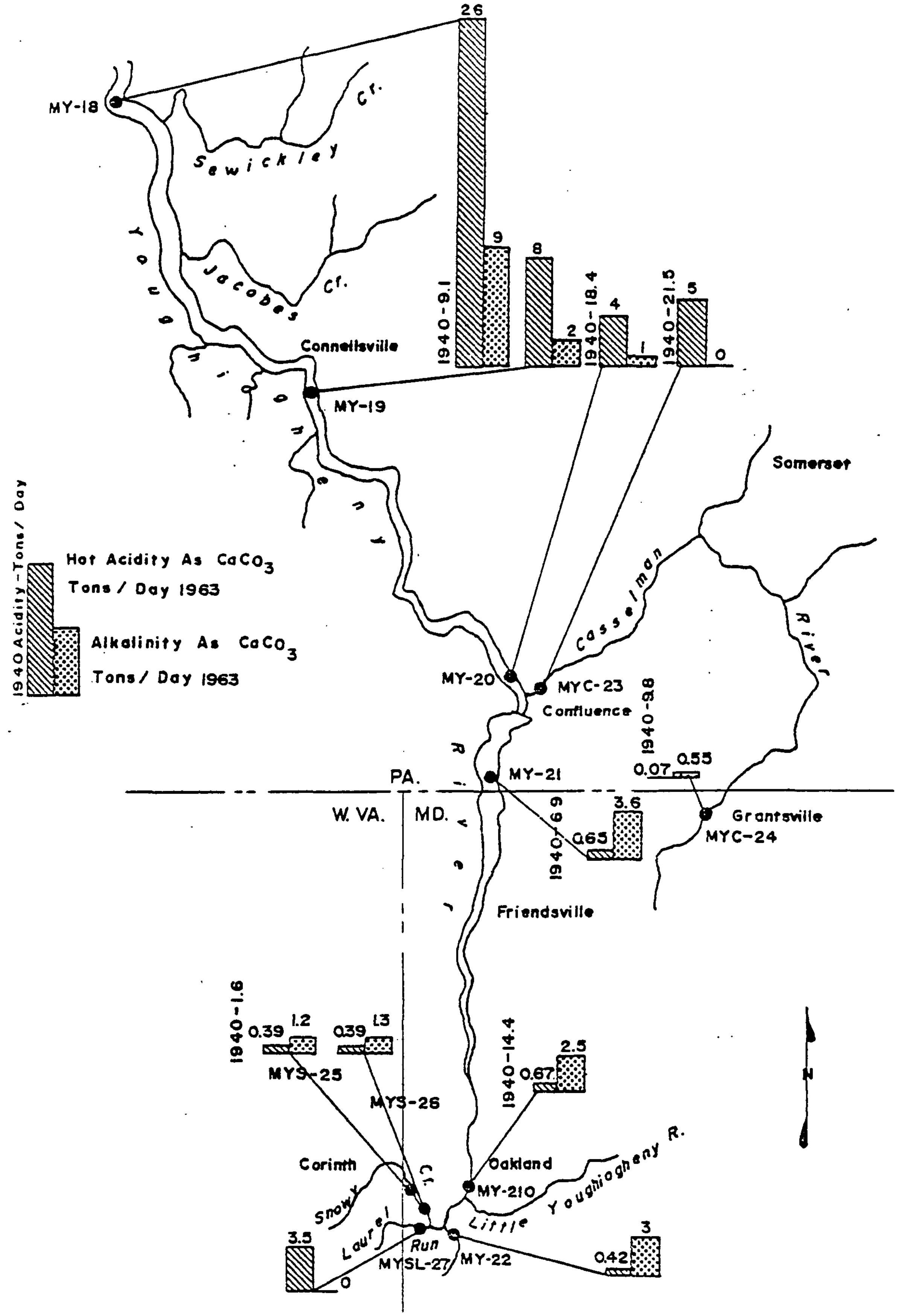
FIGURE 2.1.6.-37

1963 ACIDITY AND ALKALINITY IN THE YOUGHIOGHENY RIVER

- - -

1940 ACIDITY COMPARISON

Source (16)



An important amendment to the Clean Streams Law in 1965 gave the polluted streams of Pennsylvania the same protection as the unpolluted ones. The Department of Health required all active mine discharges to meet effluent standards. These were:

- pH range 6.0 - 9.0
- Total iron concentration not more than 7 milligrams per liter
- Alkalinity greater than acidity

A comparison between the observations in 1940 (47) and a study done in 1965 by the University of Pittsburgh (17) indicates small changes in the pH values in the Allegheny and Monongahela Basins. Table 2.1.6.-52 shows the comparative pH values in both the mainstem and major tributary in each basin. There was noticeable improvement in the Ohio River in Pennsylvania and in the Monongahela at its mouth, but the other rivers and tributaries showed only marginal increase in pH.

Despite this small progress in abatement, the area affected by acid mine drainage remained large. Figure 2.1.6.-38 shows the streams in the Allegheny Basin significantly affected by mine water in the late 1960's. More than 1,000 miles of streams in the watershed were affected to some degree by coal mining (51). In the Monongahela Basin the area affected is shown in Figure 2.1.6.-39. Between 1963 and 1970, pH and alkalinity improved significantly at Charleroi and Braddock (near Pittsburgh) on the Monongahela River, and at Sutersville and Connellsville on the Youghiogheny River. There was slight improvement at the Youghiogheny River Dam but no apparent change at Greensboro on the Monongahela (18). A map of this area is shown in Figure 2.1.6.-40.

TABLE 2.1.6.-52

COMPARISON OF pH VALUES IN THE UPPER OHIO RIVER BASIN BETWEEN 1940 AND 1965

After Sources (47), (17)

River	1940 (47)*		1965 (17)**	
	pH	Number of Samples	pH	Number of Samples
Allegheny above Kiskiminetas	7.3	14	7.3	57
Kiskiminetas	3.2	6	3.7	80
Allegheny Mouth	6.6	12	6.9	80
Monongahela above Youghiogheny	4.2	17	4.8	80
Youghiogheny	6.1	6	6.4	79
Monongahela Mouth	4.9	12	6.5	79
Ohio in Pennsylvania	5.4	22	6.8	80

*Source (47) samples were obtained at intermittent intervals during the period August-December 1940.

**Source (17) samples were obtained on a regular basis during the period October 1964 - September 1965 at approximately the same stations as used in Source (47).

FIGURE 2.1.6.-38

TRIBUTARIES OF THE ALLEGHENY RIVER AFFECTED BY COAL MINE WASTES IN THE LATE 1960's

Source (51)

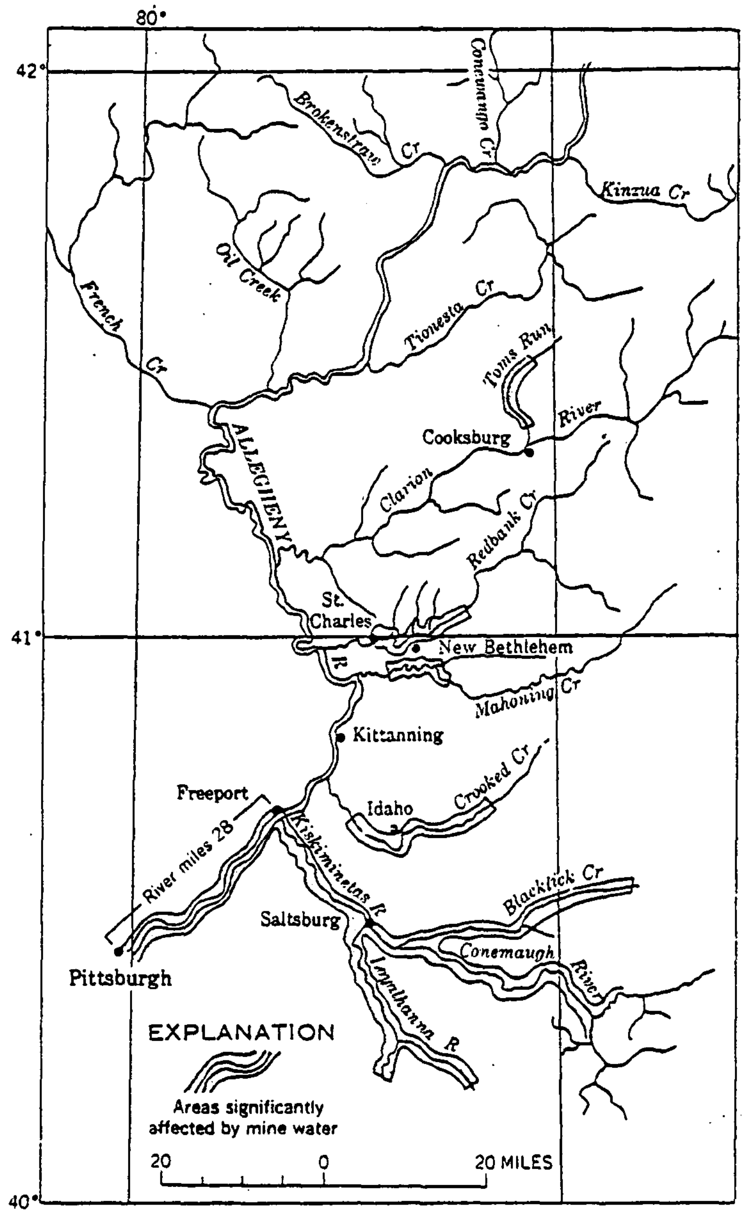


FIGURE 2.1.6.-39

TRIBUTARIES OF THE MONONGAHELA RIVER
AFFECTED BY COAL MINE WASTES IN THE LATE 1960's

Source (18)

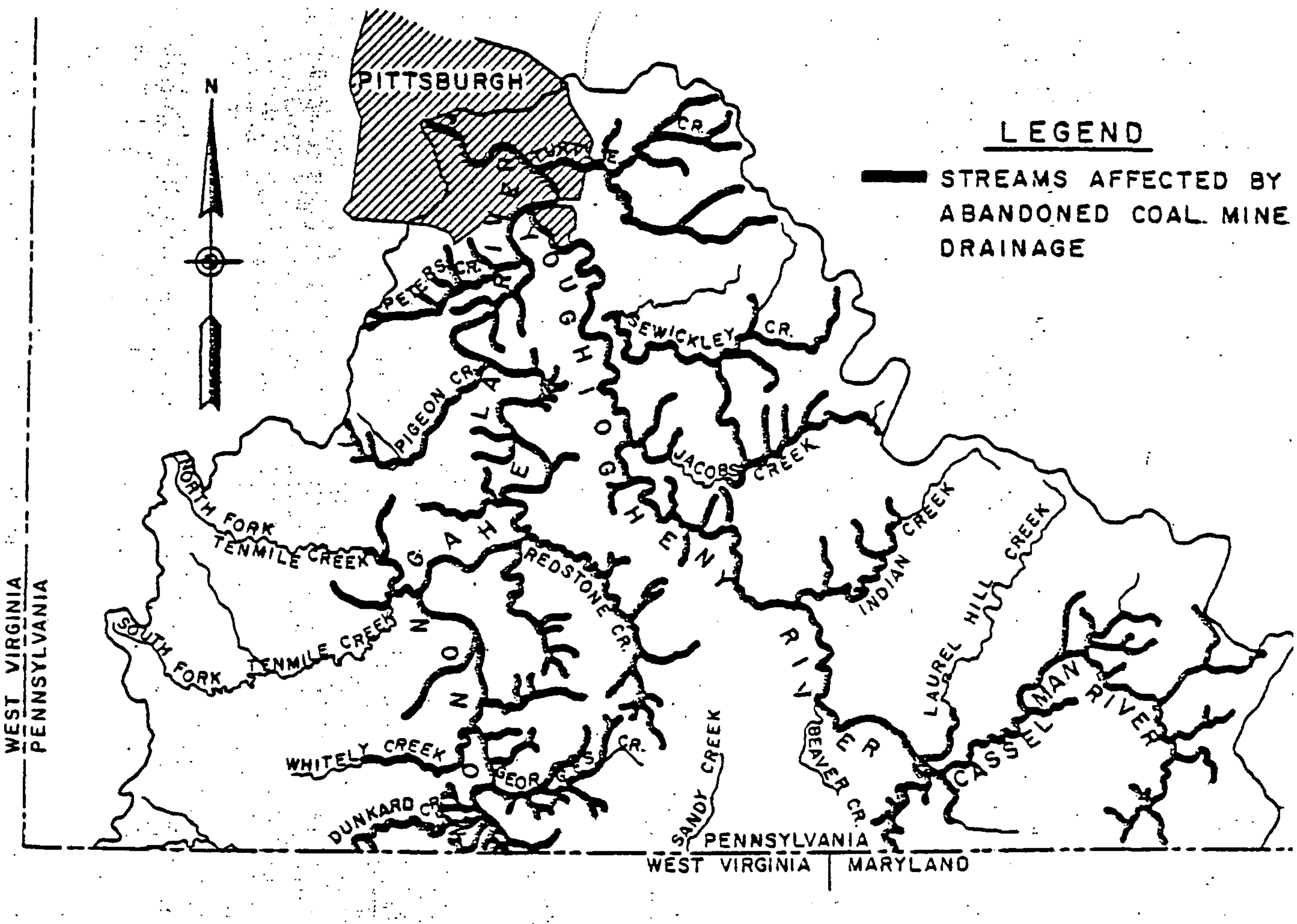
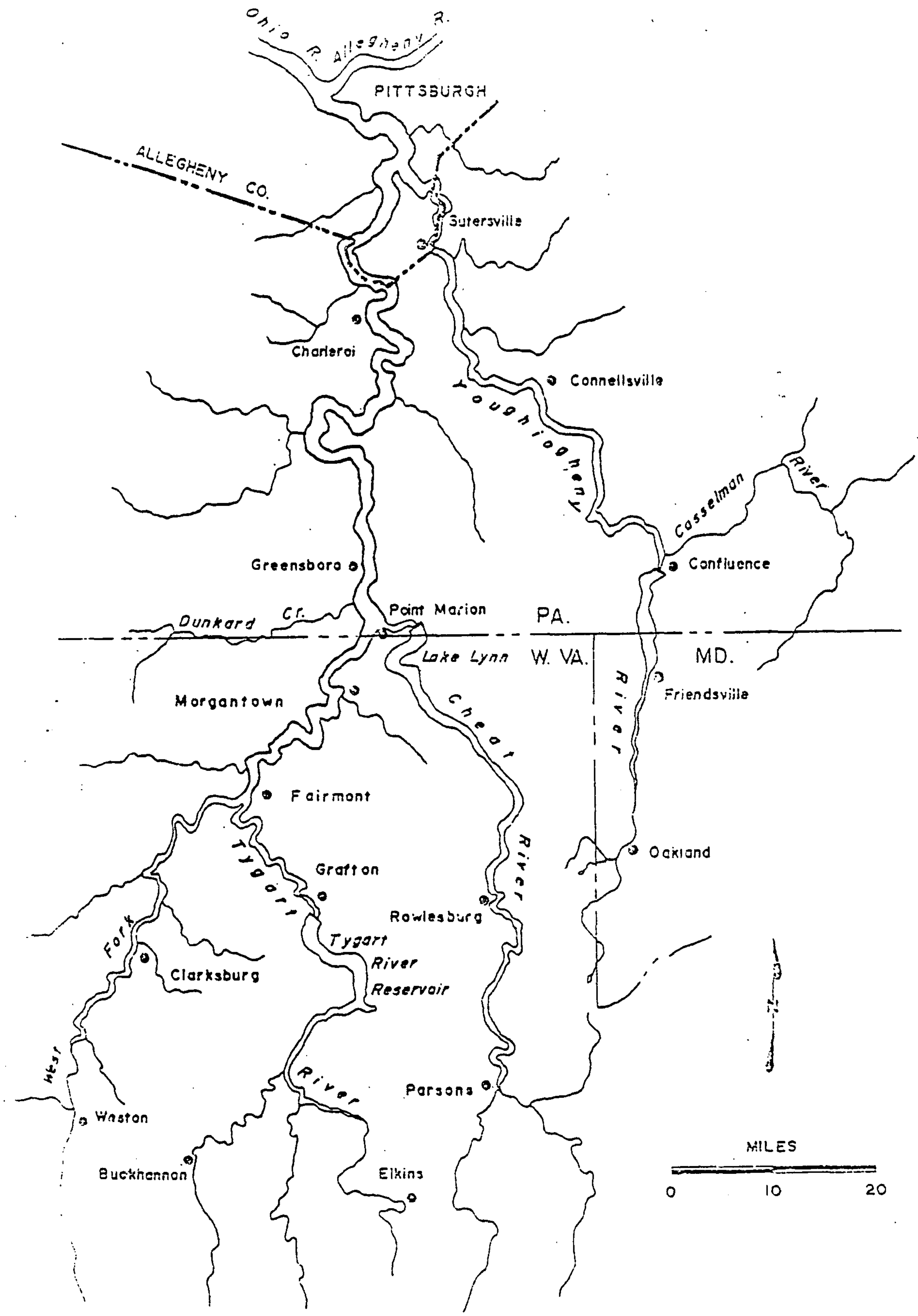


FIGURE 2.1.6.-40

MAP OF THE MONONGAHELA RIVER BASIN

Source (16)



The U.S. Bureau of Mines began to study the neutralization of acid mine drainage in 1966 (53). Two years later "Operation Scarlift" got underway as part of a $500 million bond issue that was approved by the Pennsylvania legislature under the Land and Water Conservation and Reclamation Act of 1968. "Scarlift" provided for the expenditure of $200 million over a 10-year period to remove the land and water scars of past coal mining. Abandoned mine drainage was the target of the bulk of this allocation, to the tune of $150 million (2). Although some abatement projects had been funded by the Pennsylvania government prior to "Operation Scarlift," they were more moderate in scale and area. For example, approximately $85,000 was spent on 27 abatement projects in the Monongahela Basin between 1965 and 1971 (18). This covered Allegheny, Fayette, Somerset, and Westmoreland counties.

C. Current Status (1970's)

The 1970 amendments to the Clean Streams Law broadened control over potential pollution by requiring plans for treatment facilities for mine drainage before permits for mine operation were issued. The operation of a strip mine requires three permits:

- Mining license
- Surface mining permit for the specific location
- Water discharge permit (NPDES)

The first two permits are issued by the Bureau of Surface Mine Reclamation and require restoration of the site to its original contours. The third permit is issued by the Bureau of Water Quality Management and requires plans and engineering data which indicate the manner in which pollution will be prevented during and after the operation of the mine. Plans for treatment facilities must be included if the coal seam does not contain sufficient lime to treat the mine discharge naturally. Deep mine applications must include geologic structure maps showing the manner of mine development (including maintenance of barriers along outcrops) and pertinent hydrogeologic data regarding the sealing of the mine after completion (18).

The current standards for mine discharge are those of the National Pollutant Discharge Elimination System (NPDES) which requires:

- pH: 6.0 to 9.0
- Iron: no more than 7.0 mg/l
- Alkalinity greater than acidity
- Suspended solids: not more than 30 mg/l

The proposed Federal effluent standards for best practical control technology are as follows: (2)

	30-Day Average Maximum	Daily Maximum
pH	6.0 - 7.0	6.0 - 9.0
Total iron	3.5 mg/l	7.0 mg/l
Dissolved iron	0.3 mg/l	0.6 mg/l
Aluminum	2.0 mg/l	4.0 mg/l
Manganese	2.0 mg/l	4.0 mg/l
Nickel	0.2 mg/l	0.4 mg/l
Zinc	0.2 mg/l	0.4 mg/l
Total suspended solids	35.0 mg/l	70.0 mg/l

The number of facilities which have violated these standards since 1972 are listed in Table 2.1.6.-53 for the counties in the ORBES region in Pennsylvania. As can be seen from the Table about 11% of treatment facilities report incidents of stream pollution due to malfunctioning. However, this does not represent the true seriousness of the problem because there are many abandoned mines which have no drainage treatment facilities.

An exacerbation of the acidity problem is the neglect of treatment of sewage in acid streams. It has been known since as early as 1910 that acid mine drainage inhibits the growth of sewerage organisms. In 1971, 60% of the

TABLE 2.1.6.-53

RECENT* WATER QUALITY VIOLATIONS
AT ACID MINE DRAINAGE TREATMENT PLANTS IN WESTERN PENNSYLVANIA

After Sources (1), (2), (3)

County	Deep Mines		Surface Mines	
	Number of Violations**	Number of Facilities	Number of Violations***	Number of Facilities
Allegheny	1	5	1	13
Armstrong	0	12	15	81
Beaver	0	1	1	9
Butler	1	3	1	18
Cambria		13		
Clarion	0	1	12	98
Elk	0	1	2	11
Fayette	0	2	1	62
Forest	0	0	0	0
Greene	3	8	0	6
Indiana	3	18	1	48
Jefferson	0	2	3	54
Lawrence	0	0	0	16
Mercer	0	0	0	6
Somerset		6		
Venango	0	0	1	14
Washington	3	15	0	25
Westmoreland	1	5	1	47

*As of November 1975.

**Cited for violating stream quality standards.

***Occasionally violating stream quality standards, but not necessarily cited.

municipalities in Pennsylvania that discharged into acid streams did not treat their sewage, despite court orders. This was due to the low incentive to treat sewage where the improvement was difficult to detect because of the already degraded condition of the stream (18). The danger inherent in this practice is that acid streams, essentially devoid of biological populations, cannot effectively assimilate organic waste. The organic material is carried downstream unaffected until it reaches a "healthy" portion of the stream, where it often exerts too great a demand on the stream's oxygen resource. Excessive deoxygenation can result because of the high biological oxygen demand.

The streams so affected by acid mine drainage that the 1983 water quality criteria could not be met regardless of the treatment level of other wastewater effluents, were classified "acid mine drainage affected" by DER. The streams receiving the acid mine drainage mostly from abandoned mines which will prevent attaining water quality standards even with perfect control of all point sources, were placed in Category III. The streams affected by acid mine drainage and their classification (Class and Category) are listed in Table 2.1.6.-14 for the Monongahela River Basin, in Table 2.1.6.-23 for the Allegheny River Basin, and in Table 2.1.6.-32 for the Ohio River Mainstem Basin. The standards for pH and total iron are often exceeded in these streams and concentrations of calcium, magnesium, sulfate, manganese, aluminum, and other trace elements are high (see Tables 2.1.6.-15, 2.1.6.-24, and 2.1.6.-33 for the same three river basins, respectively).

Until recently the Monongahela River was severely degraded by acid mine drainage. The mainstem was acidic from the head of the river at Fairmont, West Virginia, to the mouth at Pittsburgh, Pennsylvania. In the last few years there has been substantial progress in the abatement programs and pH related problems have been reduced considerably. During the summer of 1975 an intermediate-flow survey conducted by the Army Corps of Engineers (23), showed that the pH of the mainstream ranged from 6.5-7.5. The low flow survey showed a range of pH 3.8-8.0. Figure 2.1.6.-41 depicts the variation in pH with mileage along the Monongahela River in the Summer of 1973. The problem area lies between Maxwell Dam (River Mile 65) and Lock and Dam #8 (River Mile 95). Hatfield Power Plant is located in this reach at River Mile 78. Mines in the Morgantown area will, at times, cause pH depressions and this is evident at Lock and Dam #8. The most abrupt pH depression occurs immediately downstream of the mouth of the Cheat River. When the flow at Dam #8 is low (less than 1,000 cubic feet per sec.), there is little water available for the dilution and neutralization of the acid Cheat River water. Acid is discharged from Lake Lynn, a private hydroelectric power station of 19 megawatts peak capacity, located several miles upstream of the mouth of the Cheat. Because travel time below the mouth is relatively slow during low flow, the acid discharges from Lake Lynn are retained and concentrated in this reach. Figure 2.1.6.-40 shows the location of this area which is just north of the Pennsylvania-West Virginia state line.

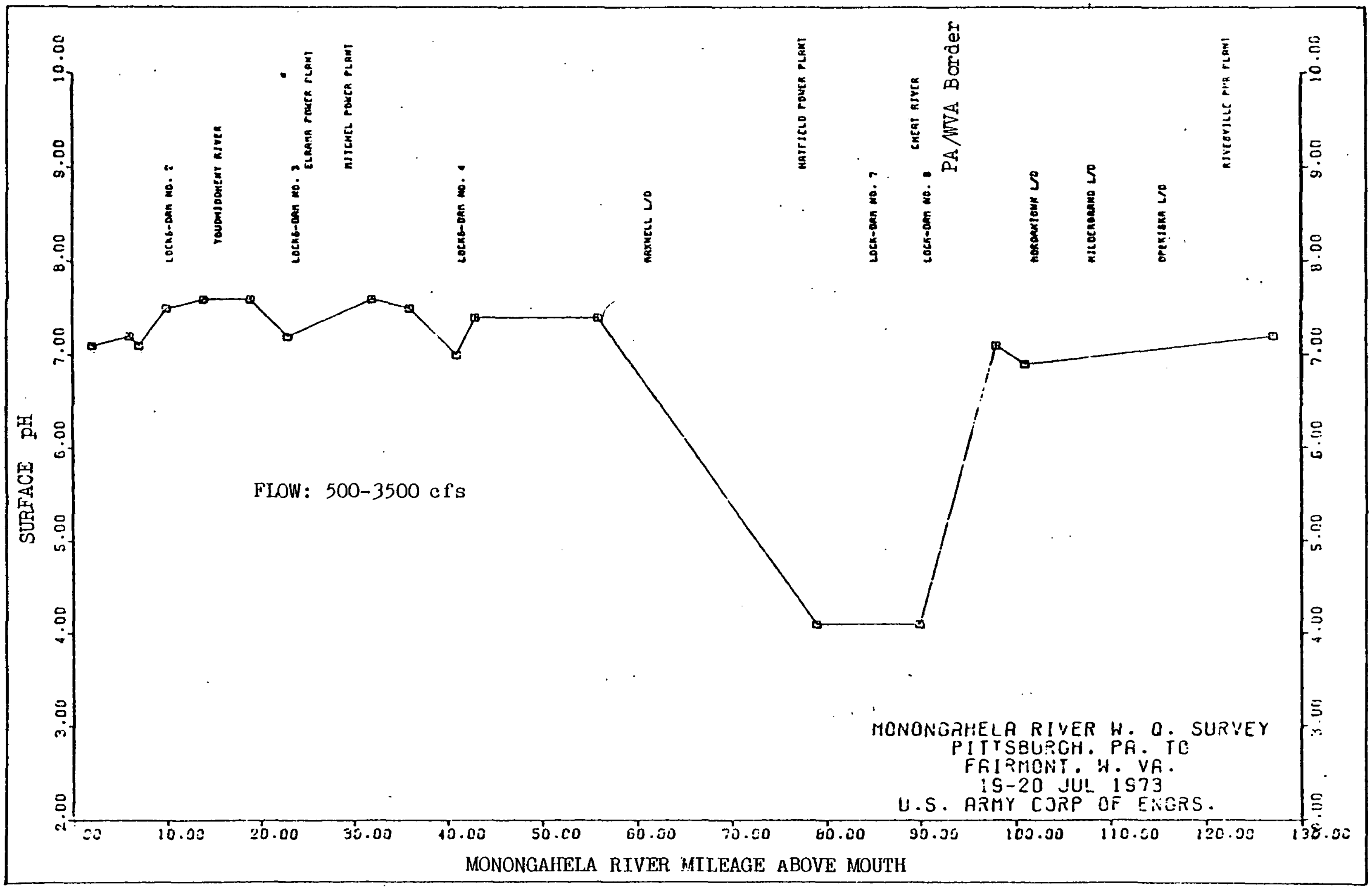
The following list and discussion of streams affected by acid mine drainage is taken from the COWAMP Reports (1) and (2). The limits mentioned are those set for desirable stream quality; i.e. total iron concentrations less than 1.5 mg/l and pH 6 to 8.5.

COWAMP AREA #9

Allegheny County

Tributary of Bull Creek, 18A - incidents of mine drainage pollution as a result of malfunctioning treatment systems.
Turtle Creek, 19A - severely depressed throughout by mine drainage, essentially dead.
Thompson Run, 19A.
Youghiogheny River, 19D.

FIGURE 2.1.6.-41 VARIATION IN pH ALONG THE MONONGAHELA RIVER IN 1973 Source (23)



Peters Creek and Tributaries, 19C - marginally affected; four of 13 samples over a 900-day period (1972-1975) were above the maximum limit for total iron; pH remained within limits for this same period.

Chartiers Creek and Tributaries, 20F - severely depressed by acid mine drainage; since before 1955 total iron concentrations have been consistently above the maximum limit; 19 of 40 samples taken from 1962 to 1971 were below the minimum pH limit; all 8 samples from 1971 to 1975 were within limits.

Montour Run and Tributaries, 20G.

Deer Creek, 18A - over an 800-day period (1972-1974) total iron concentrations and pH were within limits.

Plum Creek and Tributaries, 18A - moderately to severely depressed by acid mine drainage.

Perry Mill Run, 19C.

Pine Creek,18A - depressed downstream from Wildwood Mine; incidents of mine drainage pollution as a result of malfunctioning treatment systems; 8 of 15 samples taken over an 800-day period (1972-1974) were above the total iron concentration limit; however, pH was always within limits.

Allegheny River, 18A - marginally affected; total iron concentration frequently rose above the limit from 1955 through 1974; pH fell below the limit on occasion from 1962 through 1973.

Monongahela River, 19A and 19C - marginally affected; from 1955 through 1974 total iron concentration was above the limit and pH below the limit frequently.

Armstrong County

Tributary Mudlick Creek, 19D - incidents of mine drainage pollution as a result of malfunctioning treatment system.

Crooked Creek and Reservoir, 17E - severe acid mine drainage pollution at mouth; incidents of mine drainage pollution as a result of malfunctioning treatment system; total iron concentrations were frequently above the limits from 1958 through 1971; from 1971 through 1975 total iron concentrations were within or nearly within limits; pH was on most occasions from 1963 through 1970 below the minimum limit; however, from 1970 through 1975, pH has remained within limits.

Kiskiminetas River, 18B - severe AMD pollution at mouth; from 1955 to 1975 total iron concentrations have been above the limit on all but three occasions; from 1963 to 1975, pH has been below the limit on all but one occasion.

Long Run and Tributaries, 18B.

Big Run and Tributaries, 18C - incidents of mine drainage pollution as a result of malfunctioning treatment system.

Guffy Run and Tributaries, 18B.

Mahoning Creek, 17D - severe AMD pollution at mouth; incidents of mine drainage pollution as a result of malfunctioning treatment. system; total iron concentrations and pH have been within limits on most occasions in other sections.

Pine Run and Tributaries, 17D.

Glade Run and Tributaries, 17D.

Cowanshannock Creek, 17E - somewhat depressed in headwaters by AMD; recovered at mouth; from 1972 through 1975, total iron concentrations exceeded limits in only 2 of 14 samples; pH remained within limits during this period.
Tributary of Roaring Run, 18B - incidents of mine drainage pollution as a result of malfunctioning treatment system.
Tributary of Allegheny River, 17D - incidents of mine drainage pollution as a result of malfunctioning treatment system.
Redbank Creek, 17C and 17D - depressed by AMD near mouth; incidents of mine drainage pollution as a result of malfunctioning treatment system.
Buffalo Creek, 18F - depressed by AMD in headwaters, good to excellent remainder of length; incidents of mine drainage pollution as a result of malfunctioning treatment system; total iron and pH limits were infrequently exceeded from 1962 to 1975.
Tributary of Allegheny River, 17C - incidents of mine drainage pollution as a result of malfunctioning treatment systems.
Tributary of Allegheny River, 17E - incidents of mine drainage pollution as a result of 2 malfunctioning treatment systems.
Tributaries to Scrubgrass Creek, 17D - incidents of mine drainage pollution as a result of malfunctioning treatment system.
Limestone Run, 17E - incidents of mine drainage pollution as a result of malfunctioning treatment system.
Garret Run, 17E - incidents of mine drainage pollution as a result of malfunctioning treatment system.
Whiskey Run, 18C - incidents of mine drainage pollution as a result of malfunctioning treatment system.

Beaver County

Raccoon Creek, 20D - total iron concentrations from 1955 through 1974 have, on most occasions, been above the limit; pH from 1962 through 1974 has most often been below the limit; however, all samples since mid-1972 through 1974 have been within limits.
Tributary Brush Run, 20B - incidents of mine drainage pollution as a result of malfunctioning treatment system.

Butler County

North Slippery Rock Creek and Tributaries, 20C - 1972 through 1974 pH remained within limits; total iron limit was exceeded once in mid-1973.
Bear Creek, 17C - severely depressed downstream from abandoned strip mines.
Yellow Creek, 20C - severely depressed by AMD.
Tributary of Yellow Creek, 20C - fair stream conditions indicated.
Tributaries Allegheny River, 17C - incidents of mine drainage pollution as a result of malfunctioning treatment system.
Tributary Mulligan Run, 20C - incidents of mine drainage pollution as a result of malfunctioning treatment system.

Fayette County

Jacobs Creek, 19D.
Indian Creek, 19E.
Champion Creek and Tributaries, 19E.
Stony Run and Tributaries, 19E.
Poplar Run and Tributaries, 19E.
Monongahela River, 19C and 19G - marginally affected; from 1962 through 1973 total iron concentrations and pH were rarely within limits.
Youghiogheny River, 19C and 19G - marginally affected; from 1962 through 1974 total iron concentrations and pH rarely beyond limits.
Galley Creek, 19C.
Redstone Creek, 19C - total iron concentrations from 1964 to 1975 have been above the maximum limit; pH rarely below the minimum.
Bolden Run and Tributaries, 19C.
Bute Run and Tributaries, 19C.
Rankin Run and Tributaries, 19C.
Browns Run and Tributaries, 19C.
Jacobs Creek and Tributaries, 19G.
Cats Creek and Tributaries, 19G.
York Run, 19G - severely depressed by AMD from strip mining.
Georges Creek, 19G - severely depressed by strip mine runoff from York Run
Little Sandy Creek, 19G - headwater drainage of poor quality due to mine drainage.
Dunlap Creek, 19C - some mine drainage problems; conditions improving.
Ferguson Creek, 19D - incidents of mine drainage pollution as a result of malfunctioning treatment system.

Greene County

Dunkard Creek, 19G - depressed downstream by mine drainage; incidents of mine drainage pollution as a result of malfunctioning treatment system; all samples taken from 1955 through 1974 had total iron concentrations equal to or greater than the limit; from 1963 to 1971 pH was most frequently below limit; 1971 through 1974 produced samples within the limits for pH.
Whiteley Creek, 19G - incidents of mine drainage pollutions as a result of malfunctioning treatment system.
Tributary Witley Creek, 19G - very good quality; Buckeye Coal Company discharge showed no permanent damage.
Muddy Creek, 19B - slightly depressed upstream by intermittent mine drainage from Buckeye Coal Company; incidents of mine drainage pollution of malfunctioning treatment system.

Indiana County

North Branch Two Lick Creek and Tributaries, 18D.
South Branch Two Lick Creek and Tributaries, 18D.
Dixon Run and Tributaries, 18D.
Two Lick Creek, 18D - 1962 through 1974 samples were rarely within

limits for total iron concentration and pH; total iron above the maximum and pH below the minimum.

Penn Run and Tributaries, 18D.

Two Lick Creek Reservoir, 18D.

Yellow Creek and Tributaries, 18D - productivity is very low; several tributaries are severely polluted with mine drainage.

Blacklick Creek, 18D - 1962 to 1975, all samples had pH below minimum limit; 1955 to 1975 total iron concentration was above maximum limit.

Stevens Run, 18D - incidents of mine drainage pollution as a result of malfunctioning treatment system.

Carney Run, 18D - incidents of mine drainage pollution as a result of malfunctioning treatment system.

Brush Creek Tributaries, 18D.

Ahltman Run and Tributaries, 18D.

Whiskey Run and Tributaries, 18C.

Big Run and Tributaries, 18C.

Richards Run and Tributaries, 18D.

Tributary Crooked Creek 17E - incidents of mine drainage pollution as a result of malfunctioning treatment system.

Tributary Blacklegs Creek, 18C - incidents of mine drainage pollution as a result of malfunctioning treatment system.

Hicks Run, 18D - incidents of mine drainage pollution as a result of malfunctioning treatment system.

Washington County

Harmon Creek and Tributaries, 20D - severely depressed due to mine drainage, especially aluminum; slight recovery in lowest reaches.

North Forks Cross Creek and Tributaries, 20D.

Cross Creek and Tributaries, 20D.

Raccoon Creek, 20D.

Burgetts Fork, 20D.

Chartiers Run, 20F.

Chartiers Creek, 20F - severely depressed by AMD; incidents of mine drainage pollution as a result of malfunctioning treatment system; from 1972 through 1974, pH has remained within limits, total iron concentration has risen above the limit on occasion.

Peters Creek, 19C - marginally affected.

Maple Creek and Tributaries, 19C.

Pigeon Creek, 19C - marginally affected; incidents of mine drainage pollution as a result of malfunctioning treatment system; from 1972 through 1974, total iron concentration has risen above the limit on occasion; pH has remained within limits; excessive amounts of manganese.

Brush Run, 20F - incidents of mine drainage pollution as a result of malfunctioning treatment system.

Westmoreland County

Beaver Run, 18B.

Walford Run and Tributaries, 18B.

Getty Run and Tributaries, 18C.

Loyalhanna River and Reservoir, 18C - severely depressed in downstream zones; from 1962 to 1975, total iron concentration and pH have rarely been within limits.
Crabtree Creek and Tributaries, 18C - incidents of mine drainage pollution as a result of malfunctioning treatment system
Union Run and Tributaries, 18C.
Saxman Run and Tributaries, 18C.
Jamison Reservoir and Tributaries, 18C.
Brush Creek, 19A.
Turtle Creek, 19A - severely depressed throughout by mine drainage; essentially dead.
Sewickley Creek, 19D - several sources of mine drainage eliminate most aquatic life; from 1963 through 1974 on all but one occasion, total iron concentration above the maximum limit; pH frequently below the lower limit.
Barren Run, 19D.
Meadow Run, 19D.
Stauffer Run, 19D.
Sherrick Run, 19D.
Youghiogheny River, 19D - marginally acid downstream from confluence with Casselman River; incidents of mine drainage pollution as a result of malfunctioning treatment system; from 1955 through 1974, total iron concentration remained below maximum limit; from 1962 to mid-1969, pH below the minimum limit frequently; from mid-1969 through 1973, pH has remained within limits.

COWAMP AREA #8

In Clarion County 12 malfunctioning surface mine drainage treatment facilities have caused pollution in nine streams: Long Run and Jacks Run (17C) in Porter Township, tributary to Curtly Run (17B) in Beaver Township, tributary to Cherry Run (17B) in Toby Township, Piney Creek (17B) in Limestone Township, Bausch Run (17B) in Monroe Township, unnamed run to Deer Creek (17B) in Elk Township, tributary to Toby Creek (17B) in Highland Township, Little Licking Creek (17B) in Limestone Township, and an unnamed tributary to Anderson Run and Licking Creek (17B) in Licking and Perry Townships.

Two streams in Elk County, Beaver Run (17A) and an unnamed tributary to Little Toby Creek (17A), both in Fox Township, have been polluted by malfunctioning surface mine drainage treatment facilities. There was one similar problem in Venango County on the East Branch Wolf Creek (20C) in Irwin Township. No other counties indicated problems resulting from either surface or deep mine drainage treatment facilities.

Non-point source AMD occurs in Mill Creek (17A), Toby Creek (17A), Deer Creek (17B), Paint Creek (17B), Little Piney Creek (17B), Licking Creek and its tributaries (17B), Little Licking Creek (17B), and the main stream of the Clarion River (17B) at its confluence with Toby Creek (17A) approximately one mile from its mouth, discharging into Piney Dam (17A).

On the Clarion River only Station 825 just above Glen Hazel had a consistently low pH, generally between pH 4 to 6 prior to 1971 and only once thereafter, in 1974. Other stations (821, 822, 823, 824, 833, and 843) occasionally had pH's below 6.0 and total iron concentrations greater than 1.5 mg/l.

East Sandy Creek (16G) is polluted at its headwater area by acid mine drainage; several Scarlift projects are underway in this area. Mahoning Creek (17D) also is affected by severe acid mine drainage at its mouth. In the Bear Creek Basin (17C), the north branch is affected by drainage from extensive strip mining. Fiddlers Run (17C), Leisure Run (17C), Town Run (17C), Welch Run (17C), Runaway Run (17C), and Redbank Creek (17C) show evidence of acid mine drainage pollution. Several Operation Scarlift projects also are in operation in this area.

High sedimentation problems and correspondingly high total dissolved solids (TDS) values probably can be found in acid mine drainage problem areas. Slippery Rock Creek (20C) in the area of McConnell's Mills State Park has sedimentation problems and high dissolved solids values due to active open pit limestone mining in the surrounding area and strip and deep mine activity.

Abatement programs are designed to prevent the initial formation of sulfuric acid, backed up by treatment facilities and river flow regulation.

All active mines have been required to treat acid drainage since 1965. In 1975, there were 105 deep mine drainage treatment facilities in the PA ORBES Region. These are summarized in Table 2.1.6.-54 according to activity status for each county. The estimated total actual flow treated is also given.

There were over 700 facilities in existence for surface mine drainage treatment. Their numbers in each county and activity status are given in Table 2.1.6.-55.

More details of the treatment plants (both for deep and surface mine drainage), effluents, and effects on the receiving stream water quality are available in the COWAMP Study Reports (1), (2), (3), (4).

The effluent from active mine drainage treatment facilities comprises the smaller portion of the mine drainage reaching the surface waters in the area. The drainage from only a few abandoned mines receives direct treatment, the majority reaches the surface waters without any treatment at all. (Actually,

TABLE 2.1.6.-54

DEEP MINE DRAINAGE TREATMENT SUMMARY
IN THE PA. ORBES REGION AS OF 1975

Sources (1), (2), (3), (4)

County	No. of Active Facilities	No. of Inactive Facilities	No. of Completed Facilities	No. of Facilities Not Started	Total No. of Facilities	Total Actual Flow (mgd)
Allegheny	5	0	0	0	5	6.0
Armstrong	9	1	1	1	12	5.3
Beaver	1	0	0	0	1	0.04*
Butler	1	0	0	2	3	3.3
Cambria	13	0	0	0	13	
Clarion	0	1	0	0	1	0.0005
Clearfield	5	0	0	0	5	
Elk	1	0	0	0	1	Var.
Fayette	2	0	0	0	2	5.1
Greene	8	0	0	0	8	6.6
Indiana	12	2	2	2	18	3.5
Jefferson	0	1	1	0	2	0.001
Somerset	14	0	0	0	14	
Washington	14	0	1	0	15	11.7
Westmoreland	4	1	0	0	5	16.7
Totals	89	6	5	5	105	58.2+

*Design flow used.

TABLE 2.1.6.-55

SURFACE MINE DRAINAGE TREATMENT SUMMARY
IN THE PA ORBES REGION AS OF 1975*

Sources (1), (2), (4)

County	No. of Active Facilities	No. of Inactive Facilities	No. of Completed Facilities	Total No. of Facilities
Allegheny	10	3	0	13
Armstrong	75	14	5	94
Bever	9	0	0	9
Butler	19**	0	0	19
Clarion	124	1	6	131
Clearfield	129	0	0	129
Elk	21	0	2	23
Fayette	61	0	1	62
Greene	6	0	0	6
Indiana	49	0	0	49
Jefferson	53	0	1	54
Lawrence	14	2	0	16
Mercer	3	3	0	6
Venango	14	0	0	14
Washington	28	0	0	28
Westmoreland	47	0	0	47
Totals	662	23	15	700

*Cambridge and Somerset Counties not included.
**Includes two facilities of uncertain status.

deep mines abandoned before 1966 have not been included in the COWAMP inventory due to lack of data.) However, if mining is to be initiated in the area of an abandoned mine, the company must assume the responsibility for treatment of the discharge from the old mine.

Current iron and acid loads in the streams of the Upper Ohio Basin are listed in Table 2.1.6.-56. Also given is the type of mine (active or abandoned) responsible for the loads. The predominant number of sources are either abandoned mines or marginal cases where it is not known whether the source is active or inactive. The Table is based entirely on a literature review of available data and does not represent a comprehensive listing (1), (2).

Responsibility for abatement of acid mine drainage from former operations has been taken up by the Pennsylvania Department of Environmental Resources (D.E.R.). This is because the original mine operator cannot legally be held responsible for acid mine drainages that now emanate from abandoned sites. The program adopted by D.E.R. in 1967 consisted of four stages (18):

Phase I: Source Inventory.

Field crews located and mapped the sources of pollution from abandoned mines.

Phase II: Engineering Studies and Plans.

Feasibility studies were undertaken and engineering plans for abatement were drawn up.

Phase III: Construction.

- Sealing of deep mines
- Burial of exposed acid-forming refuse.
- Backfilling pre-act strip pits
- Correction of defective backfills
- Diversion of streams and rainfall run-off seeping into mines

TABLE 2.1.6.-56 ACIDITY AND IRON LOADS IN THE STREAMS OF WESTERN PENNSYLVANIA After Sources (1), (2)

Stream	No. of Sources				Average Annual Discharge (gpm)	Total Acidity Load (lbs/day)	Total Iron Load (lbs/day)
	Mines			Other			
	Active	Unknown	Inactive				
<u>Allegheny River Basin</u>							
Redbank Creek*		2		2	102	327	152
Mahoning Creek		38			5,500	2,036	1,226
Big Scrubgrass Creek		31			3,165	7,167	220
Clarion River							
Toby Creek (Clarion County)			68	14	2,090	81,005	6,558
Piney Creek	3		70	6	1,623	10,941	678
Mill Creek			15	6	423	6,947	611
Licking Creek	1		141	1	1,095	6,314	673
Toby Creek (Elk and Jefferson Counties)	3		118	1	10,164	37,408	2,311
Deer Creek			43	16	1,403	10,842	2,119
East Branch Clarion River		33				5,568	186
Cowanshannock Creek						8,789	1,380
Kiskiminetas River	2		78	9	4,439	57,880	8,802
Conemaugh River	1		29	6	3,045	35,104	11,587
Blacklick Creek	14		125	22	25,196	273,196	58,174
Twolick Creek	7		143	24	7,102	36,645	4,023
Loyalhanna Creek		47		5	11,165	65,407	26,090
<u>Monongahela River Basin</u>							
Lower Monongahela		232				12,400	9,069
Middle Monongahela		125				50,400	16,428
Upper Monongahela**		195				233,453	64,844
Redstone and Dunlap Creeks		20				21,203	18,352
Tenmile Creek		53				838	2,094
Dunkard Creek**		30				10,994	4,506
Big Sandy Creek**		42				1,496	160

TABLE 2.1.6.-56 (Continued)

Stream	No. of Sources: Mines: Active	No. of Sources: Mines: Unknown	No. of Sources: Mines: Inactive	No. of Sources: Other	Average Annual Discharge (gpm)	Total Acidity Load (lbs/day)	Total Iron Load (lbs/day)
Monongahela River Basin (Cont.)							
Youghiogheny River	1		14		13,653	26,200	12,720
Sewickley Creek	2		12		14,326	73,780	19,610
Jacobs Creek			2		42	810	140
Indian Creek			7		944	13,510	1,230
Ohio River Mainstem Basin							
Beaver River							
Slippery Rock Creek		83		4	7,326	8,073	528
Chartiers Creek		4			2,657	4,868	1,728
Robinson Run		17			1,506	8,381	3,437
N. Br. Robinson Run		16			1,328	9,099	372
Millers Run		2			1,552	9,764	1,294
Saw Mill Run		4					
Raccoon Creek		3					
Unnamed Tributaries		30			1,698	22,648	1,355
Burgetts Fork		14			1,616	21,674	3,947
Little Raccoon Run		25			463	7,307	382
St. Patrick Run		12			488	5,681	432
Brush Run		6			281	3,620	24
Chamberlain Run		3			125	1,007	11
Dilloe Run		1			120	2,988	42
Bigger Run		7			633	9,258	817
Potato Garden Run		31			373	10,190	1,633

*Available unpublished information includes only major pollution sources in the Welch Run Watershed.

**Portions of basins in West Virginia are included.

. Regulation of stream flows by low flow augmentation

. Treatment

Phase IV: Operation and maintenance of abatement facilities such as treatment plants, mine seals and flow regulation dams.

When "Operation Scarlift" became operational in 1968, numerous specific projects were undertaken because of the huge increase in funds available. Table 2.1.6.-57 lists the number of projects in the ORBES Pennsylvania counties, both completed and current, as of December 1975.

Approximately $76 million of the ten-year allotment for abandoned mine projects ($150 million) had been encumbered as of December 1975 and $50 million had been actually disbursed over the State. A detailed listing of project locations and descriptions is given in the Appendices to Chapter VI of the COWAMP Reports for Study Areas #8 and #9 (1), (2).

Sludge generated by acid mine drainage treatment is handled in a variety of ways. The volume generated is very large and contains from 1 - 5% dry solids by weight (53). Systems either currently in use, or proposed, for dewatering and disposal of sludge include (53): lagoons, landfill, abandoned deep mines, air drying, porous drying beds, and vacuum filtration.

Details concerning the sludge generated from each mine drainage facility in western Pennsylvania counties is presented in COWAMP Reports (1)& (2). The estimated sludge volumes are summarized in Table 2.1.6.-58.

TABLE 2.1.6.-57

NUMBER OF OPERATION SCARLIFT PROJECTS
IN WESTERN PENNSYLVANIA COUNTIES
(As of December 1975)

Sources (1), (2), (3)

County	Completed Projects	Current Projects	Total Projects
Allegheny	20	19	39
Armstrong	2	1	3
Beaver	1	2	3
Butler	24	22	46
Cambria	10	2	12
Clarion	6	19	25
Clearfield			
Elk	9	18	27
Fayette	7	8	15
Indiana	14	16	30
Jefferson	4	2	6
Lawrence	1	0	1
Mercer	3	1	4
Somerset	5	4	9
Venango	5	10	15
Washington	15	18	33
Westmoreland	11	10	21
Totals	137	152	289

TABLE 2.1.6.-58

ACID MINE DRAINAGE SLUDGE PRODUCTION SUMMARY

Sources (1), (2)

County	Total Wet Sludge Produced (tons/day)		Total Dry Sludge Produced (tons/day)	
	Deep	Surface*	Deep	Surface*
Allegheny	1,480	3	130	0.1
Armstrong	3,340	450	90	12.2
Beaver	-	-	-	-
Butler	2,710	-	70	-
Clarion	0.4	2.5	0.01	0.06
Elk	-	4.8	-	0.15
Fayette	130	50	110	1.5
Greene	5,430	-	140	-
Indiana	1,500	3	75	0.1
Jefferson	0.8	116.8	-	2.74
Washington	8,230	-	230	-
Westmoreland	8,890	-	350	-
Totals	31,711.2	630.1	1,200	15.35

*Many data gaps exist.

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