Water Quality Assessment for the

OHIO RIVER MAIN STEM

(Pennsylvania, West Virginia, Ohio)

WORK DOCUMENT 49

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
WHEELING FIELD OFFICE
SURVEILLANCE & ANALYSIS DIVISION

WATER QUALITY ASSESSMENT REPORT

OHIO RIVER MAIN STEM

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DESCRIPTION

The Ohio River main stem is formed at Pittsburgh, Pennsylvania with the confluence of the Allegheny River (11,705 sq. miles) and the Monongahela River (7,384 sq. miles). It flows in a westerly direction for 40 miles in Pennsylvania to form the boundary of Ohio and West Virginia, where its course is changed generally to a southerly direction. The Ohio River becomes the boundary of Kentucky and Ohio 317 miles below Pittsburgh, Pennsylvania.

This report is concerned with the 317 mile reach of river from Pittsburgh, Pennsylvania to the West Virginia-Kentucky boundary. The first 40 miles of the Ohio River lie totally in the State of Pennsylvania, while the next 277 mile reach is the boundary between Ohio and West Virginia. By the original boundary of the early colonies, the Ohio River is considered to be within the jurisdiction of West Virginia to the low water mark of the State of Ohio shore as defined by court action near the ~~turn~~ end of the ~~twentieth~~ nineteenth century.

WATER QUALITY ASSESSMENT REPORT
OHIO RIVER MAIN STEM (M.P. 0-317)

INTRODUCTION

The purpose of this document is to provide answers to four questions: (1) what is the current water quality situation; (2) why does the situation exist; (3) what has been the trend in recent years; (4) what will the water quality be in years to come? In reviewing the Ohio River main stem in 1973, identification is made of (a) significant river reaches that already meet the 1983 goal of water quality adequate for swimming and for the protection and propation of fish and wildlife, as outlined in Section 101 of the 1972 Water Pollution Control Act Amendments, and (b) river reaches that are expected to achieve the 1983 goal by 1977, 1983 or some later date.

This document is a summary in nature and is not intended to provide a detailed analysis of the water quality of the basin or to examine all the present or potential factors which act upon the water quality of the river. This report only covers the Ohio River main stem and minor tributaries, and does not consider any of the large or major tributaries. The information contained in this document is based primarily on surveillance and monitoring activities carried out by the EPA, Region III, Surveillance and Analysis Division, Wheeling Field Office, plus appropriate data from State and other Federal agencies. This document should provide a starting point for the detailed examination of needs, priorities, standards, load limitations and other factors to meet the 1983 goal. of?

METHODOLOGY

Only minor tributaries having a total drainage area of more than 100 square miles were considered for review except where known water quality problems existed. The major tributaries such as the Allegheny, Monongahela, Beaver, Little Kanawha, Kanawha, Guyandotte and Big Sandy Rivers are not part of this document.

The criteria for classifying the Ohio River and minor tributaries are listed in Table I. Although these criteria include information for both cold and warm water fishery, only warm water conditions can be considered for the Ohio River. In general, data are limited for taste and odor, and total dissolved gases content with respect to the existing atmospheric conditions.

The EPA Wheeling Field Office has conducted ~~routine~~ regular water quality monitoring ~~activities~~ on the 317 mile reach of the Ohio River for several years for about 9 permanent stations and 7 tributary stations as shown in Table II and the ~~first~~ maps in the back of this report. In addition, many special industrial, and stream investigations have been conducted in this reach over the years. For purposes of this review, current data are considered for the period 1970 to present. Pre-1970 data were evaluated for comparative purposes and trends. Projections were made for the years 1977 and 1983.

THE CURRENT WATER QUALITY SITUATION

The Water Quality Summary (Table III) includes a review of the 317 miles of the Ohio River and minor tributaries that have any water quality problems. Nine minor tributaries did not meet water quality standards prior to 1970. Recent State and EPA data indicate that two of these minor tributaries have ~~obtained~~ attained secondary recreation and warm water fishery quality at the present time. Some of the degraded minor tributaries have long term problems that need immediate attention.

Minor Tributaries

Saw Mill Run (mouth at Ohio River M.P. 1.0), a small tributary in Pittsburgh, Pennsylvania, has been the subject of much publicity because of domestic sewage pollution. Many broken sewers run into the creek causing the stream to be septic at times. Although solution to the problem is ~~simple~~ technically clear, action ~~is slow to~~ by the city of Pittsburgh construct~~ing~~ a new sewerage system ~~by the City of Pittsburgh.~~ has been slow.

Chartiers Creek, which has its mouth at Ohio River M.P. 2.5, has a drainage area of 278.1 sq. miles. This sub basin has acid mine drainage problems, which degrade much of the stream. About 57 miles of this tributary has lower than desired pH with high acidity content. There are also several local domestic sewage problems which contaminate the stream. The water quality improvements to this stream will be slow in developing.

Raccoon Creek, which has its mouth at Ohio River, M.P. 29.5, has a drainage area of 183.9 sq. miles. Over 54 miles of stream are affected by acid mine drainage with a pH as low as 3.4 recorded. The Wheeling Field Office made a detailed field investigation of this area in 1968. Its present water quality is poor, and improvements will be slow in developing.

The Little Beaver River, which empties into the Ohio River at M.P. 39.5 has a drainage area of 102 sq. miles. Some localized acid mine drainage caused problems prior to 1970, but this has shown more recent improvement.

Harmon Creek has continued to have problems over the years at its mouth at Weirton, West Virginia at Ohio River, M.P. 66.7 because of acid mine drainage, sedimentation and industrial pollution from the Weirton Steel Division mill. The industrial problems have been improved over the years because of the use of oil separation and holding lagoons. Acid mine drainage and sedimentation caused by highway and dam construction continues to cause problems in this watershed. The Wheeling Field Office has investigated this stream several times over the last 9 years.

For many years, Wheeling Creek has had localized domestic sewage and acid mine drainage, which affected the stream at Wheeling, West Virginia, Ohio River M.P. 90.6. The active coal mines in this sub basin have installed neutralizing facilities, which have improved the quality of the stream. Some localized domestic wastes still get into the stream at times. Field investigations have been made by the Wheeling Field Office on many occasions showing that more participation is needed by the Wheeling-Ohio County Health Department.

Sandy and Mill Creeks in Jackson County, West Virginia have had sediment problems over the years, which have affected stream quality. Better land use principles and the possible construction of small dams should improve this situation, but present conditions are still poor at times.

Twelvepole Creek which has its mouth at Huntington, West Virginia at Ohio River M.P. 313.2 has had a variety of water quality problems. These include domestic wastes, acid mine drainage and sediment. This stream does not meet water quality criteria. More active county participation is needed.

All of the minor tributaries in the study area are potentially suitable for warm water fish and wildlife, if proper treatment and control is provided.

Ohio River Main Stem

The quality of the Ohio River main stem has been affected by a number of factors. The large concentration of industry has the most influence, although some localized problems exist at certain municipalities because of improper treatment of domestic wastes.

The Ohio River from the "Point" at Pittsburgh to above New Martinsville, West Virginia has had oil, and related industrial problems that have affected the river at several points. Low dissolved oxygen has occurred below the Allegheny County Sanitary Authority sewage treatment plant at M.P. 3.1 at times because of only primary treatment of over 100 million gallons per day of domestic sewage. This condition should improve with the operation of the new secondary sewage treatment plant. The various steel mills have caused high phenolic concentrations in the river that caused taste and odor problems in public water supplies. Higher than desired total coliform and fecal coliform have occurred on occasion. Artificial substrate sampling has shown that with the exception of sludge worms, the samples generally contained few organisms. The low number of kinds and the low populations at most sampling points suggest the presence of toxic materials. Though ALCOSAN discharges organic materials at M.P. 3.2, animals that would increase their population because of the increased food supply were found in low numbers indicating the presence of toxic materials.

The number of kinds of fish inhabiting waters are an indication of the water quality. Since 1957, a number of fish studies have been conducted in this reach of the Ohio River. These have involved sampling the populations in the lock chambers at the Emsworth, Dashields, and Montgomery Dams.

A July 1959 study at Montgomery Locks and Dam produced 21 fish species, which is the greatest number collected in this reach of river. This study was conducted following a long closure of the steel industries by a labor strike. The principal difference in species composition was the occurrence of pollution sensitive fishes that invaded the previously polluted area. Six of these species, collected in the study after the industry closure, were not collected previously in the lock chambers, nor have they been collected since.

This upper reach of the Ohio River often contains chemicals and materials which show foam, scum, and oil on the surface. The City of Wellsburg, West Virginia (population 4,600) does not have a sewage treatment plant. The river is slowly improving because of some industrial treatment. The current condition in this reach is better now than before 1970, but it still does not meet water quality criteria at all times.

The Ohio River from New Martinsville, West Virginia at M.P. 128 to a point above Marietta, Ohio at M.P. 172 has had good quality water for secondary recreation and warm water fishery. The fish composition observed at M.P. 129.1 indicates improvement of water quality downstream of the first 100 miles of the Ohio River. The predominance of channel catfish and sunfishes (including the bases), along with a decrease in the carp and bullheads is indicative of more favorable conditions for pollution sensitive fishes. In general, the fish populations are satisfactory from New Martinsville, West Virginia to Marietta, Ohio. Industries must guard against spills in this reach and new industrial development must provide adequate treatment.

The Ohio River from Marietta, Ohio to below Parkersburg, West Virginia at M.P. 200 did not meet water quality criteria before 1970 because of municipal and industrial conditions. High total coliform and fecal coliform often existed along with specific contaminants from industry that appeared on an intermittent basis. These conditions have improved and the present water quality parameters meet secondary recreation and warm water fishery criteria. Industries on the Ohio River and tributaries in this reach, such as Union Carbide, Goodrich, DuPont, Marbon, Shell Chemical and others must remain on alert for not allowing chemical spills to occur. Industrial expansion must include appropriate waste treatment.

The Ohio River from the Belleville Dam to the mouth of the Kanawha River at M. P. 265 has been one of the best reaches of river in the past. This segment met secondary recreation and warm water fishery before 1970 and has improved to the primary level at the present time.

Although the Kanawha River had some minor influences on the Ohio River from M.P. 265 to 305, this reach of river met secondary warm water criteria in the past. It has not changed at the present time since some of these influences still exist plus isolated discharges of chemical wastes from the industries. The secondary criteria designation may be upgraded in the future as the Kanawha River improves and individual industries improve their treatment.

The reach of the river from M.P. 305 to the Kentucky State Line at M.P. 317 did not meet water quality criteria prior to 1970, because of problems associated with local industry and river traffic handling problems of many types of commodities. These conditions still remain about the same way. The river is often covered with coal fines, scums, oil and other materials. Conditions are often variable depending on the local activity.

The pre-1970 and present 1973 Ohio River conditions are shown on the attached maps with respect to meeting the water quality criteria. The tables and additional maps also show projected 1977 and 1983 water quality conditions. In general, overall water quality improvement should prevail, but localized intermittent discharges will continue to cause problems until responsible parties face up to their duties 100% of the time.

FACTORS AFFECTING WATER QUALITY

Water quality conditions in the Ohio River can be very changeable depending on how wastes from steel mills, coke ovens, chemical plants, power plants, barge loading and other industries are operated on a day-by-day basis. The continuous discharging of any wastes can be detrimental to the river.

From time to time some steel mills have discharged phenolic materials which could not be degraded or oxidized by river conditions. These materials were sometimes accumulated in the river from one plant site to another until the river concentration was great enough to cause taste and odor problems at municipal water intakes. Proper treatment schemes are available for reducing this problem. The public should not be subjected to wastes that affect entire water supplies.

Solids or sediment materials can cause water quality problems at many locations. Industrial plants on the Ohio River can discharge many kinds of both dissolved and suspended solids that have not been properly removed from their processes. Poor land use can also cause the run-off of many sediment materials that will decrease water quality. Some of the solid materials can be seen floating such as scums from chemical processes, and coal fines from loading facilities.

Other industrial sources that affect water quality include oils, chemicals, heat and toxicants. Each of these materials require different treatment systems, but technology is available to improve these conditions.

Coal mining activities have very serious conditions that can affect streams and rivers. Acid mine drainage is derived from air and water contacting pyrite which is usually in and around coal deposits. The pyrite contains compounds of sulfur and iron. As the coal is extracted, the pyrites are exposed to oxygen and water which react by oxidizing the pyrite. The resulting products are washed, seeped or pumped from the mines until they eventually reach a stream. The total reaction is completed in the stream which is then burdened with acids, sulfates, iron oxides and other dissolved materials such as aluminum, magnesium, manganese and calcium. Untreated acid water from deep mines and acid water carrying sediment from surface mines and refuse piles cause some localized pollution problems in some of the minor tributaries of the Ohio River in Pennsylvania and northern

West Virginia.

Domestic sewage causes some localized problems in the minor tributaries and Ohio River main stem. This is visible in small streams as gray septic water completely void of aquatic life and by the appearance of suspended solids and floating matter in larger streams.

WATER QUALITY TRENDS

Most industries, including mining, have been making steady progress in reducing water pollution. The gradual clean up of the Ohio River should continue, provided new industry will actively pursue the use of the latest treatment technology. State and Federal regulations are becoming strict, but fair to all industries and municipalities. EPA now has several years of water quality monitoring data on file to make appraisals of future conditions.

Water pollution control is a continuing activity that will require experienced people to follow-up for many years to come. Water from abandoned mines in small tributaries to the Ohio River will continue to cause localized pollution problems until public funds can solve this vast problem. The problem of inadequate sewage treatment should be corrected as each and every community provides both collection systems and adequate treatment facilities.

It is assumed that a great effort will be undertaken to improve water quality by 1983. Active and abandoned mine drainage sources will be reduced, sewage treatment plants will be built, operation of treatment facilities will be improved and new technology will be developed. Overall water quality should be improved.

Table I

Water Quality Requirements For
Recreation and Fishery Uses

Primary Recreation & Cold Water Fishing		Water contact sports such as swimming, water skiing, which involves risk of ingesting water. Protection and propagation of cold water fish species(Trout).
Fecal Coliform	-	< 200/100 ml geometric mean
pH	-	6.5 to 8.3
Dissolved Oxygen	-	> 6.0 mg/l daily average
Temperature	-	< 68° F or 5° F over natural temp.
Color	-	> 1 meter visibility of Secchi disc
Turbidity	-	< 10 Jackson Candle Units
Dissolved Solids	-	< 500 mg/l or 1/3 above natural conditions
Taste and Odor	-	none detectable in water contact use or amount which will impart taste in fish
Total Dissolved Gases	-	< 110% of existing atmospheric condition

Primary Recreation & Warm Water Fishery		Water contact sports such as swimming, water skiing, which involves risk of ingesting water. Protection and propagation of warm water fish species; i.e. basses, catfish, etc.
Fecal Coliform	-	< 200/100 ml geometric mean
pH	-	6.5 to 8.3
Dissolved Oxygen	-	> 4.0 mg/l; 5.0 mg/l daily average
Temperature	-	< 90° F or 5° F over natural temperature
Color	-	> 1 meter visibility of Secchi disc
Turbidity	-	< 10 Jackson Candle Units
Dissolved Solids	-	< 500 mg/l or 1/3 above natural conditions
Taste and Odor	-	none detectable in water contact use or amount which will impart taste in fish
Total Dissolved Gases	-	< 110% of existing atmospheric conditions

Secondary Recreation & Cold Water Fishery — All other recreation uses except those that risk ingesting water. Protection & propagation of cold water fish species (Trout).

Total Coliform	-	< 10,000/100 ml geometric mean
pH	-	6.0 to 9.0
Dissolved Oxygen	-	> 6.0 mg/l daily average
Temperature	-	< 68° F or 5° F over natural temperature
Turbidity	-	< 10 Jackson Candle Units
Dissolved Solids	-	< 1/3 above natural conditions
Taste and Odor	-	None that will impart taste to fish flesh
Total Dissolved Gases	-	< 110% of existing atmospheric conditions

Secondary Recreation & Warm Water Fishery — All other recreation uses except those that risk ingesting water. Protection & propagation of warm water fish species, i.e. basses, catfish, etc.

Total Coliform	-	< 10,000/100 ml geometric mean
pH	-	6.0 to 9.0
Dissolved Oxygen	-	> 4.0 mg/l; 5.0 mg/l daily average
Temperature	-	< 90° F or 5° F over natural conditions
Turbidity	-	< 50 Jackson Candle Units
Dissolved Solids	-	< 1/3 above natural conditions
Taste and Odor	-	None that will impart taste to fish flesh
Total Dissolved Gases	-	< 110% of existing atmospheric conditions

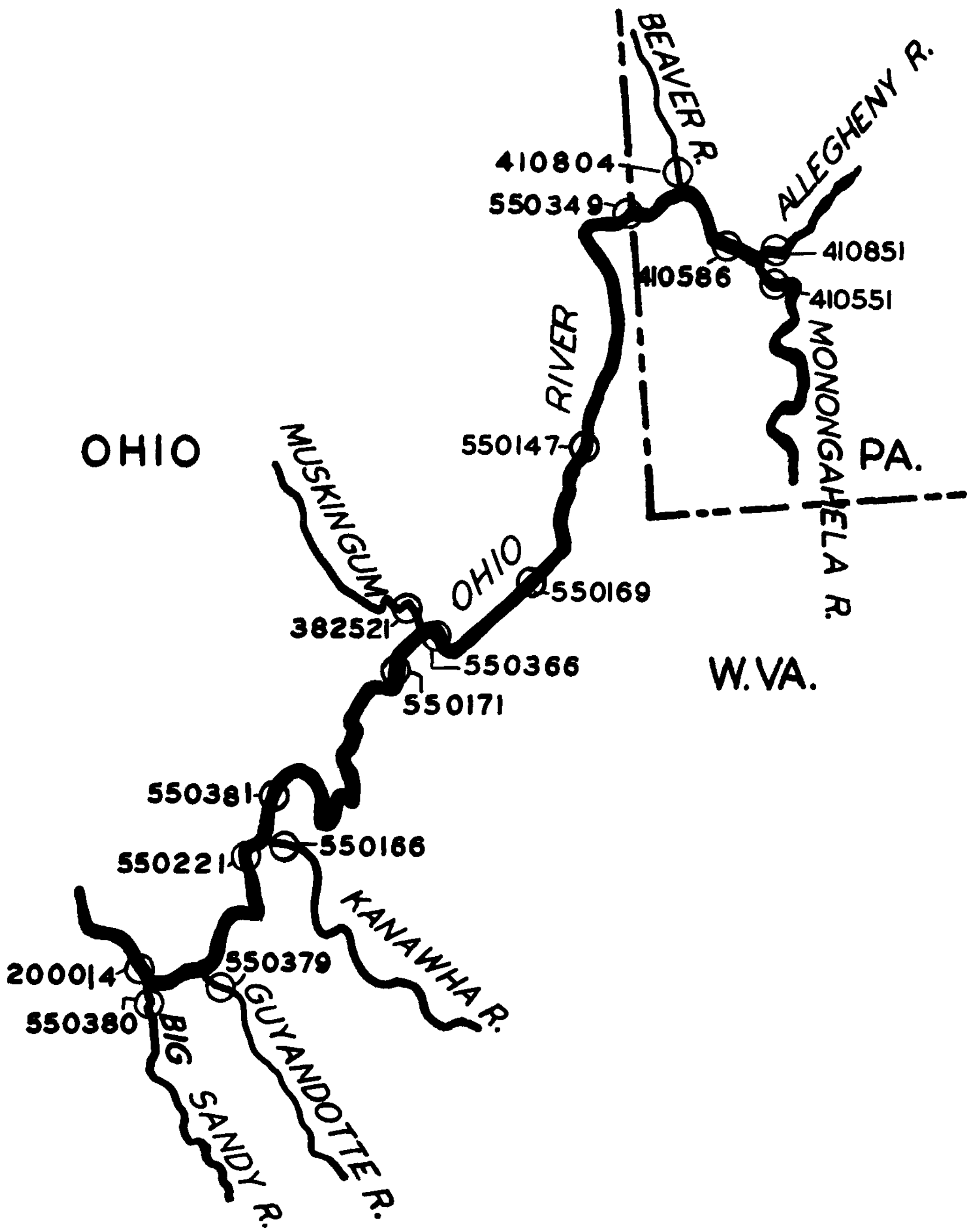
Table II

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
Wheeling Field Office
Wheeling, West Virginia

Routine Chemical and Physical
Surveillance Stations

	Station No.	Years	Description	Mile Point
*1.	410851	1964-73	Allegheny River @ 6th Street Bridge, Pittsburgh, Pennsylvania	0.5
*2.	410551	1964-73	Monongahela River @ Smithfield St. Bridge, Pittsburgh, Pennsylvania	0.8
*3.	410586	1966-73	Ohio River at South Heights, Pennsylvania	16.0
4.	410804	1968-73	Beaver River @ Rt 18 Bridge	3.0
*5.	550349	1967-73	Ohio River @ Pennsylvania - West Virginia State Line	40.0
*6.	550147	1966-73	Ohio River at Wheeling, West Virginia	86.7
7.	550169	1966-73	Ohio River at New Martinsville, West Virginia	128.0
8.	550366	1968-73	Ohio River at Marietta , Ohio above Muskingum River	172.0
9.	382521	1969-73	Muskingum River at mouth	5.7
*10.	550171	1966-73	Ohio River at Old Lock 19	192.0
*11.	550381	1968-73	Ohio River at Kyger Creek	261.2
*12.	550166	1966-73	Kanawha River at mouth	0.5
13.	550221	1966-73	Ohio River above Gallipolis Dam	278.5
14.	550379	1968-73	Guyandotte River at mouth	0.5
15.	550380	1968-73	Big Sandy River near mouth	2.5
16.	200014	1968-73	Ohio River downstream of Big Sandy River at West Virginia - Kentucky State Line	317.2

*Pesticide sample station - May and September



OHIO RIVER MAIN STEM

KEY TO TABLE III

SYMBOL	
★	Primary Recreation and Cold Water Fishery
▲	Primary Recreation and Warm Water Fishery
■	Secondary Recreation and Cold Water Fishery
●	Secondary Recreation and Warm Water Fishery
▬	Not suitable for recreation and/or Fishery

SYMBOL	
EPA	U. S. Environmental Protection Agency, Wheeling Field Office
WV	West Virginia Department of Natural Resources
AMD	Acid Mine Drainage
DW	Domestic Wastes
IW	Industrial Wastes
FC	Fecal Coliform
TC	Total Coliform

TABLE III
WATER QUALITY SUMMARY
OHIO RIVER MAIN STEM

STREAM	DRAINAGE AREA (Sq. Mi)	LENGTH (Miles)	MEETING STANDARDS FOR RECREATIONAL USES				COMMENTS
			Pre-1970	Present	1977	1983	
M.P. 1 Saw Mill Run	19.0		-	-	-	●	EPA: Domestic Wastes (High TC & FC)
M.P. 25 Chartiers Creek	278.1		-	-	●	●	EPA: AMD (57 miles), D.W. (TC, FC)
M.P. 16 Ohio R. @ So. Hgts		16.0	-	-	●	●	EPA: Low D.O. At Times
M.P. 29.5 Raccoon Creek	183.9	46	-	-	-	●	EPA: AMD (54 miles); p^H = 3.4
M.P. 39.5 Little Beaver R.	102		-	●	●	●	EPA: AMD
M.P. 40.0 Ohio R. @ PA-WV Line		40	-	-	●	●	EPA: TC, FC
M.P. 60.1 Kings Creek			●	●	▲	▲	WV:
M.P. 66.7 Harmon Creek			-	-	-	●	EPA: AMD, I.W. (p^H & Oil)
M.P. 74.8 Buffalo Creek	160	26	●	●	▲	▲	WV: Some DW at Times
M.P. 86.7 Ohio R. @ Wheeling		86.7	-	-	●	●	EPA: TC, FC
M.P. 90.6 Wheeling Creek	282	8	-	●	●	▲	EPA: DW. AMD

TABLE III
WATER QUALITY SUMMARY
OHIO RIVER MAIN STEM
(Continued)

STREAM	DRAINAGE AREA (Sq. Mi)	LENGTH (Miles)	MEETING STANDARDS FOR RECREATIONAL USES				COMMENTS
			Pre-1970	Present	1977	1983	
M.P. 113.9 Fish Creek	214		●	[illegible]	[illegible]	[illegible]	WV:
M.P. 126.0 Ohio R. @ New Martinsville		128.0	●	▲	▲	▲	EPA:
M.P. 128.5 Fishing Creek	220		●	●	▲	▲	WV:
M.P. 154 Middle Island Cr.	560	94.7	▲	▲	▲	▲	W.Va.
M.P. 172 Ohio R. @ Marietta		172.0	-	●	●	▲	EPA: TC, FC
M.P. 192 Ohio R @ Old Lk 19		192.0	-	●	●	▲	EPA:
M.P. 220.6 Sandy Creek	315	12	-	-	●	●	WV: Sediment, Turbidity
M.P. 231.5 Mill Creek	230		-	-	●	●	WV: Sediment, Turbidity
M.P. 261.2 Ohio R @ KygerCr		261.2	●	▲	▲	▲	EPA:
M.P. 278.5 Ohio R @ Gal. Dam		278.5	●	●	▲	▲	EPA:
M.P. 313.2 Twelvepole Cr.	441	32.5	-	-	●	●	EPA & WV AMD, DW, Turbidity
M.P. 317.2 Ohio R @ WV-KY		317.2	-	-	●	▲	EPA Coal Fines, Oil, Scum

MAP KEY

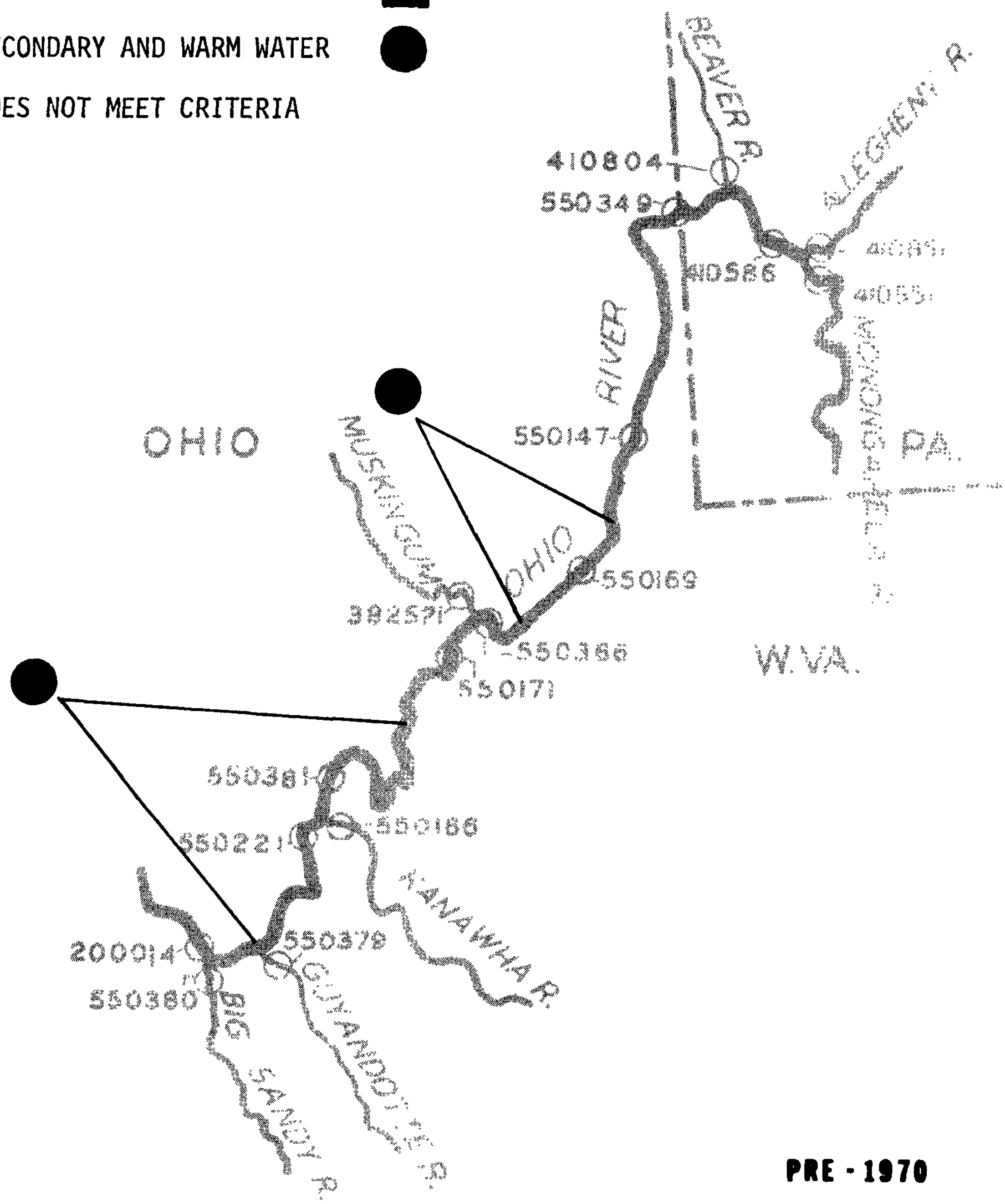
PRIMARY AND COLD WATER ★

PRIMARY AND WARM WATER ▲

SECONDARY AND COLD WATER ■

SECONDARY AND WARM WATER ●

DOES NOT MEET CRITERIA

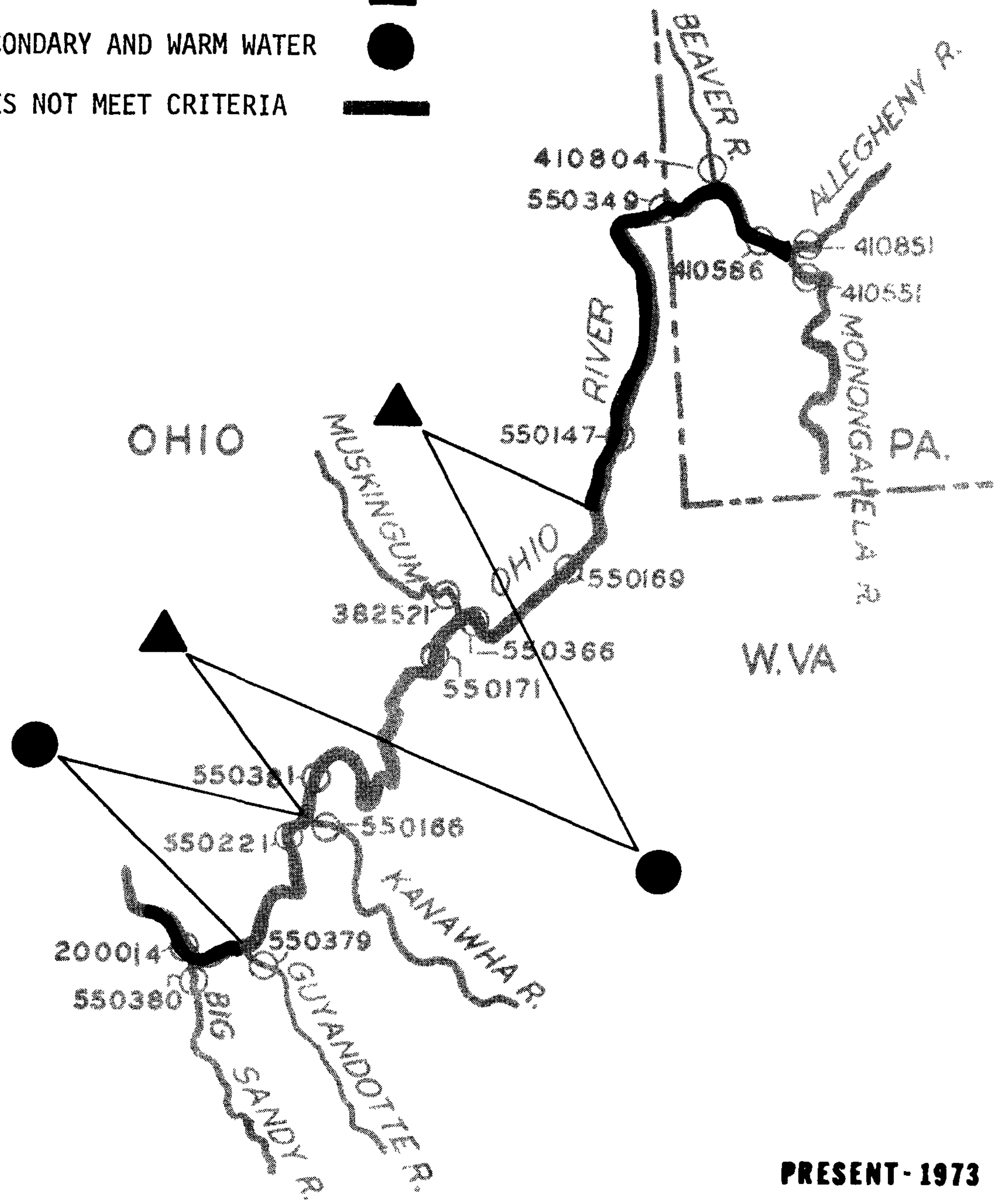


PRE - 1970

OHIO RIVER MAIN STEM

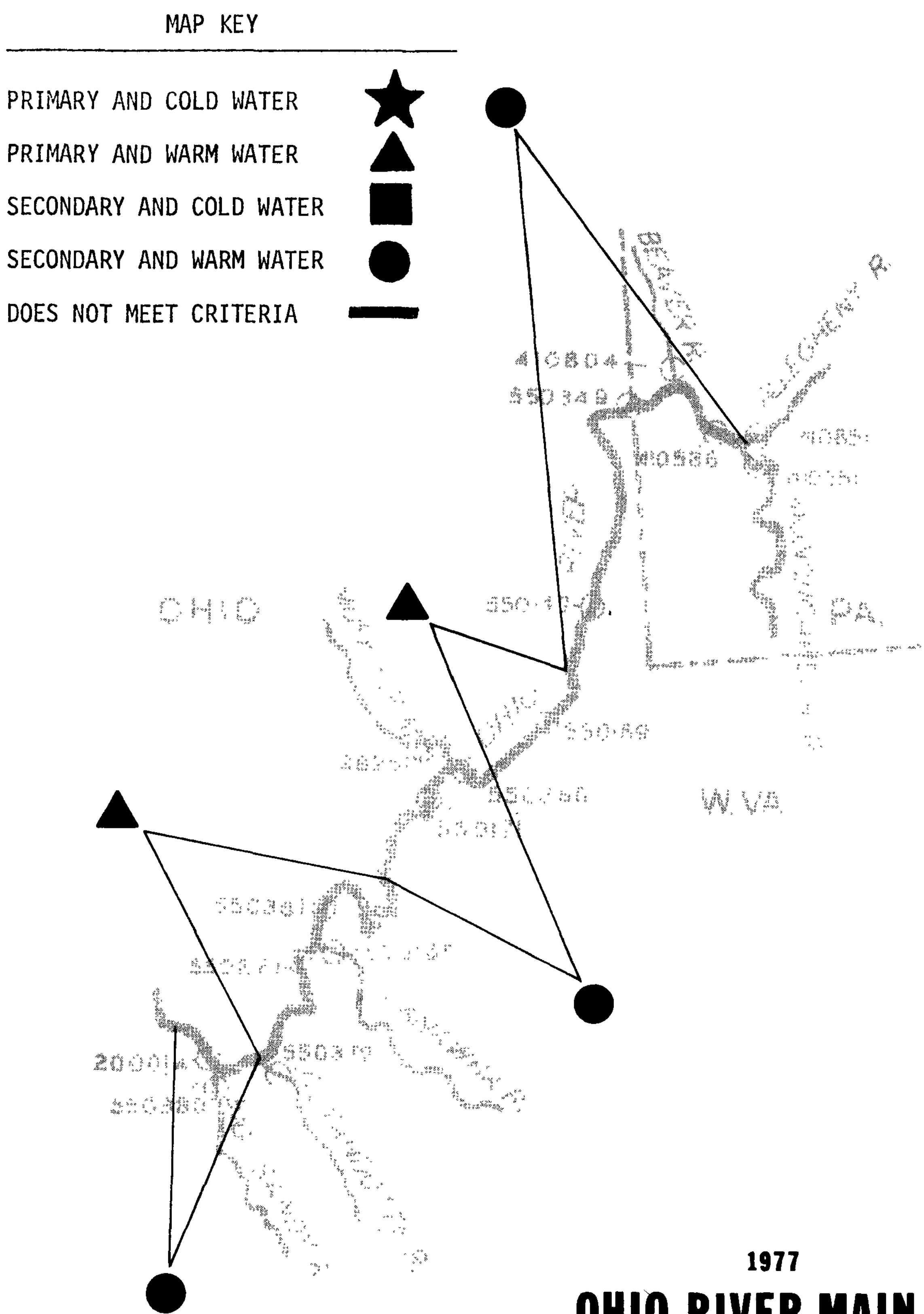
MAP KEY

PRIMARY AND COLD WATER	★
PRIMARY AND WARM WATER	▲
SECONDARY AND COLD WATER	■
SECONDARY AND WARM WATER	●
DOES NOT MEET CRITERIA	▬



PRESENT - 1973

OHIO RIVER MAIN STEM

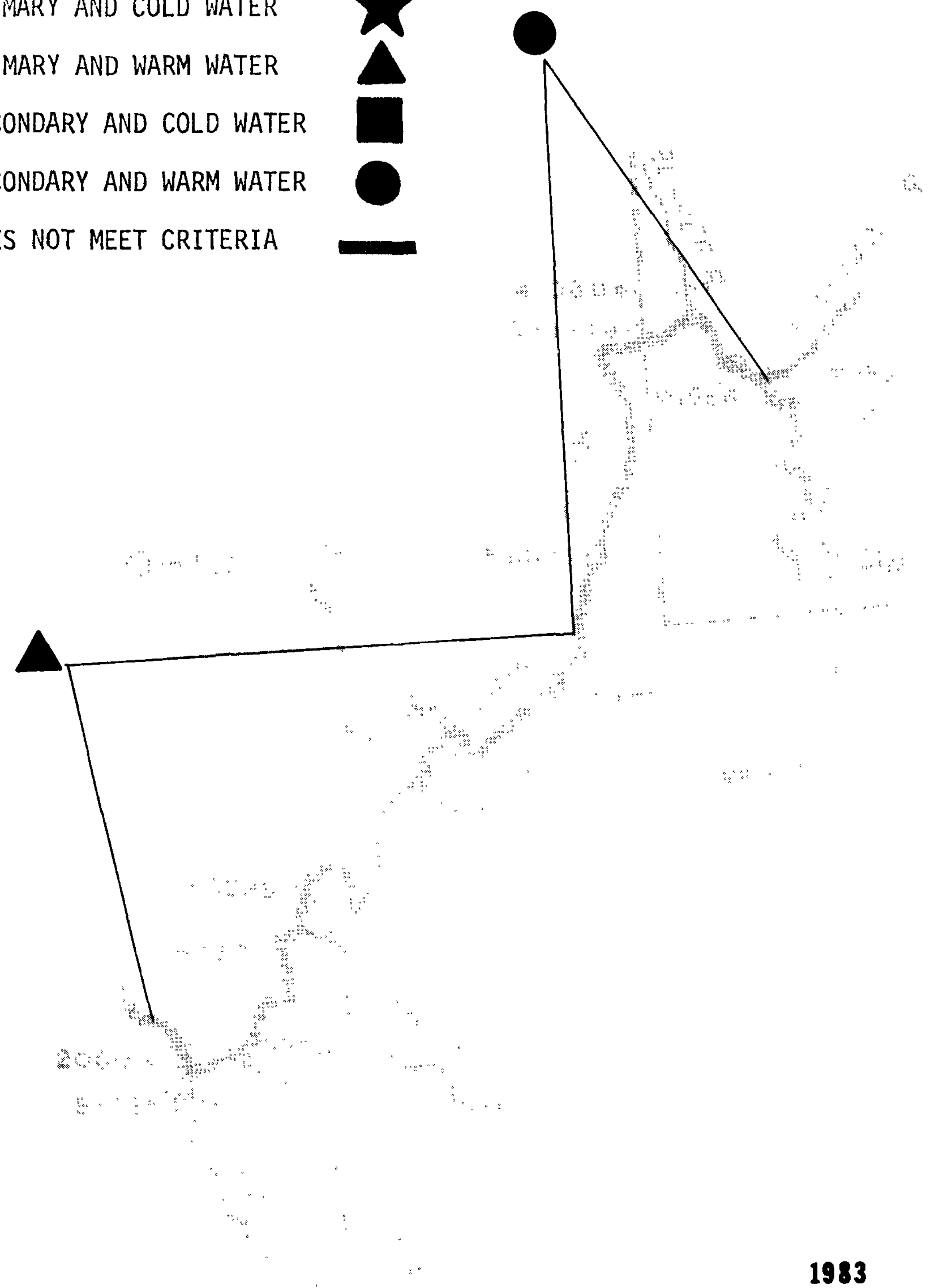


1977

OHIO RIVER MAIN STEM

MAP KEY

PRIMARY AND COLD WATER	★
PRIMARY AND WARM WATER	▲
SECONDARY AND COLD WATER	■
SECONDARY AND WARM WATER	●
DOES NOT MEET CRITERIA	▬



1983

OHIO RIVER MAIN STEM

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