ORSANCO

1969

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The Commissioners of the

OHIO RIVER VALLEY WATER SANITATION COMMISSION

an interstate compact agency
created jointly in 1948 by the

State of Illinois
State of Indiana
Commonwealth of Kentucky
State of New York
Commonwealth of Pennsylvania
Commonwealth of Virginia
State of West Virginia
State of Ohio

with approval of the
Congress of the United States

respectfully submit their

TWENTY-FIRST YEARBOOK 1969

HEADQUARTERS: 414 Walnut St., Cincinnati, Ohio 45202 Telephone: 421-1151

THE YEAR IN REVIEW

ATTENTION OF THE COMMISSION during the past year has been focused on means for adapting activities to changing circumstances and emerging needs. Concern with the posture and program of ORSANCO stems in large measure from a 1966 decision of a majority of the states signatory to the Ohio River Valley Water Sanitation Compact that unilateral establishment of standards on interstate waters was the preferred course of action in complying with a new federal law.

As a consequence the Commission deferred plans for the conduct of interstate hearings and promulgation of river-quality standards, which heretofore had been established practice. Under terms of the compact such a procedure is prerequisite for the exercise of Commission enforcement powers.

Currently, the situation is this: state standards individually submitted to the Secretary of the Interior in some cases are not compatible on certain stretches of interstate waters, and thus far they have not been reconciled to the satisfaction of the federal authorities. Meantime, the Commission has held in abeyance its plans for hearings while endeavoring to reconcile differences.

PROPOSALS UNDER REVIEW

This situation and other aspects of regional coordination in the Ohio Valley prompted a complete review of Commission responsibilities and activities. From this there emerged proposals that ranged from expediting revision of existing sewage-treatment standards and the transposition of industrial-waste control measures into enforceable regulations to such matters as the conduct of performance-audits of treatment plants to improve operating efficiency.

All of the proposals represented components of a comprehensive program to fulfill the obligations and aspirations of the interstate compact. Some of them were directed toward revitalizing certain aspects of the regional program that for one reason or another had become dormant but continued to lay claim for attention. Others relate to functions whose application to the program is of more recent origin, or which were denied activation in the past because of budget or other restraints.

There were no elements of novelty to these proposals, which in one form or other, previously found expression in staff memoranda, committee deliberations, minutes or in annual reports. These proposals are now being scrutinized by a committee of commissioners for incorporation in a policy statement.

STATUS OF INSTALLATIONS

Under terms of the compact the initial thrust of the regional program was directed toward installation of at least primary treatment facilities for all sewage discharges. This basic undertaking was virtually completed five years ago. As a result, treatment plants are now in operation serving 1,468 communities and 95 percent of the sewered population. Last year construction was started on 15 new plants serving a total population of 40,000.

Meanwhile, design plans for additional (secondary) treatment facilities at several major cities are well along toward completion. However, one cannot be sanguine as to how promptly these installations will reach the construction stage. Financing of these projects are dependent on: (1) availability of federal grants-in-aid; and (2) willingness of the cities to issue bonds at the prevailing high interest rates. Federal aid over the years has fallen far short of promises.

About 87 percent of the 1,842 industrial plants discharging directly into streams of the district are reported by the signatory states to be complying at least with ORSANCO minimum standards. At frequent periods the Commission has viewed with concern the continued status of non-compliance by certain industries. But the Commission is handicapped in taking more aggressive action because it has not yet scheduled public hearings, which were deferred in 1966 as a result of the unilateral standards-setting decision by the states.

UNDERGROUND WASTE DISPOSAL

A major undertaking initiated by the Commission was an assessment of policies, procedures and other matters allied to the practice of subsurface disposal of industrial wastewaters. The staff was instructed to develop a report offering perspective and guidelines on the regulation of underground injection, which is now being reviewed by the Commission for subsequent action.

Concern regarding this practice has mounted because of rapid increase in the number of such installations. Nationwide, there were only six industrial-waste injection systems a decade ago. Now the number is estimated at 150. In the ORSANCO district 15 systems have been installed within recent years.

The report, which is in two parts, deals with public-policy issues and with geological factors and technical criteria. The first part was prepared by Edward J. Cleary, ORSANCO staff consultant. Dr. Cleary points out that while underground disposal is proving to be economically attractive to individual producers of liquid wastes, from a social standpoint the broad extension of this practice could be regarded as the least satisfactory of the available options for pollution control.

Three basic questions are discussed: (1) under what circumstances should society find it reasonable to trade off long-range potentialities of environmental risk; (2) to what extent might proliferation of deep-well systems impair the utility of underground strata for future extraction of groundwater and mineral resources; and (3) are regulatory agencies adequately fortified with legislative directives and staff for evaluation of geo-hydrological, technological and public-interest aspects of injection proposals?

The second part of the report, prepared by Don L. Warner, sets forth regulatory guidelines and criteria for evaluating the location, design, construction and operation of injection wells, specifically with respect to geological and other circumstances in the Ohio Valley.

It is concluded by Dr. Warner that only small areas of the Ohio Valley would appear to be eliminated or significantly limited for waste injection on the basis of the most general consideration of the rock units that are present, their geologic structure and the groundwater circumstances.

Dr. Warner, a specialist in injection well practice, until recently was chief of the earth-sciences section of the Ohio River Basin Office of the Federal Water Pollution Control Administration. He is now associate professor of geological engineering at the University of Missouri.

Recommendations accompanying the report point to the establishment of an advisory committee of state geologists. Its role would be two-fold: to assist the signatory states in regulatory procedures and to oversee the maintenance of a central registry on all injection wells drilled in the Ohio Valley.

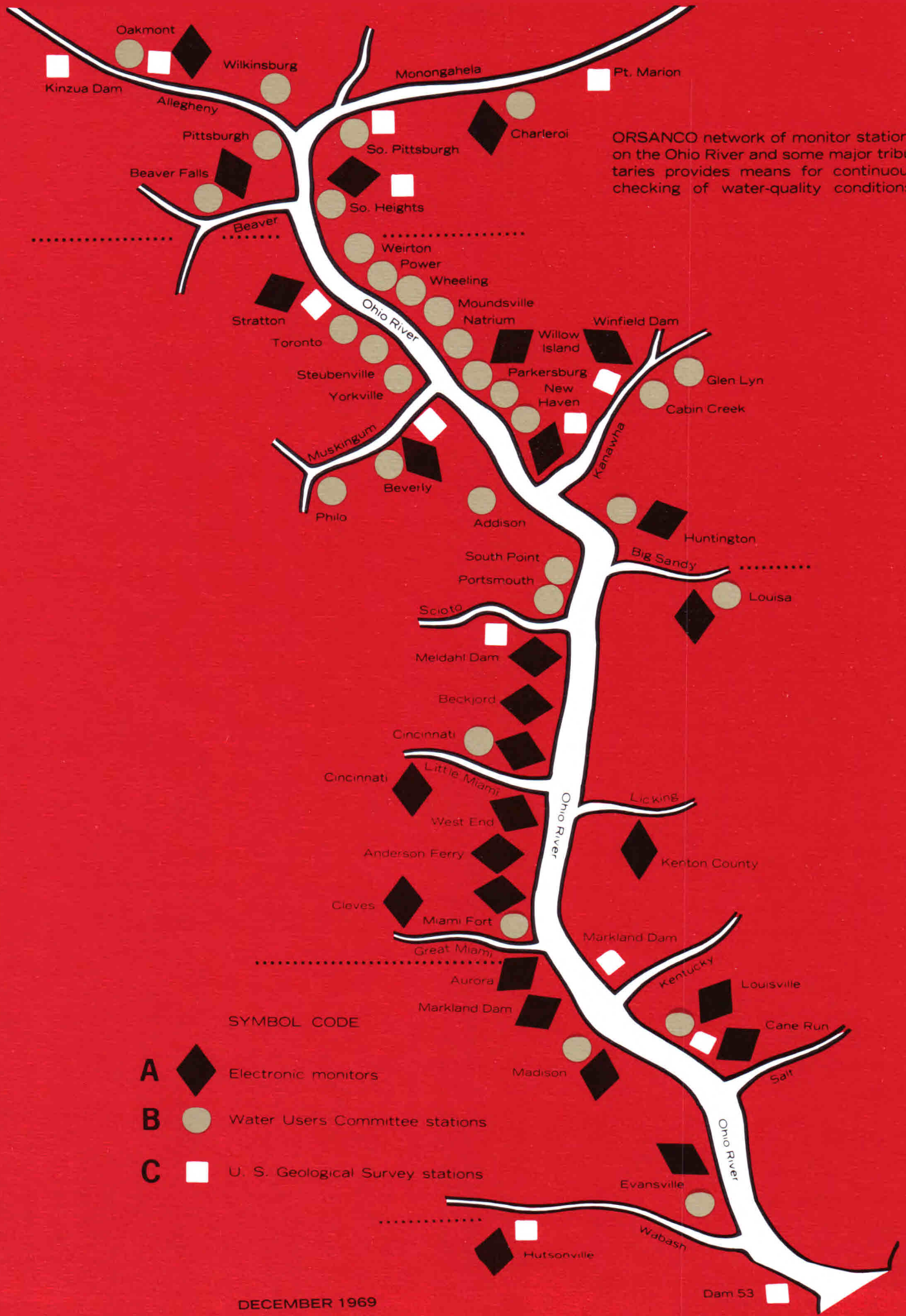
REGIONAL QUALITY MONITORING

In 1951 the signatory states delegated to ORSANCO the task of developing and operating a river-quality monitor network. Consistent progress has been made in upgrading this capability, notably with the aid of electronic monitors and computers. Currently the Commission's regional network is being supplemented by some states who have installed robot monitors located at points of specific interest to them.

A robot monitor produces a vast quantity of data, the usefulness of which depends on evaluation techniques that require computer processing. An appreciation of this by state-agency personnel who have studied Commission operations has opened the question of whether facilities and skills at ORSANCO headquarters might be employed for the processing of data from state-operated robot monitors. This is possible where state equipment is compatible with that used in the regional system. Therefore, the staff has been instructed to explore with the signatory states the terms and conditions under which such processing service could be provided.

It should be noted that processing of data from the regional robot monitoring system has now advanced to the point where quality appraisals are being furnished on a monthly basis to the signatory states, as well as to a number of federal, local and private entities concerned with quality conditions in the Ohio River and some major tributaries.

Meantime, substantial progress is being made on a demonstration project to employ the robot-monitor system for forecasting quality changes.



ORSANCO network of monitor stations on the Ohio River and some major tributaries provides means for continuous checking of water-quality conditions.

RIVER QUALITY APPRAISAL

THE OHIO RIVER VALLEY WATER SANITATION COMMISSION has been charged by its signatory members with the design and conduct of an extensive water quality monitoring system. This was started in 1951 as a manual operation, and was supplemented in 1960 by the installation of automatic monitoring equipment. More than a million analyses are made each year on quality conditions in the rivers and streams of the district.

Analyses are made through one or more of the following arrangements: 32 locations (22 on the Ohio River main stem) are monitored by managers of municipal and industrial water treatment plants, who are members of the ORSANCO Water Users Committee; 14 locations (7 on the Ohio River) are monitored by the U. S. Geological Survey under a contractual arrangement with ORSANCO; 27 locations (17 on the Ohio River) are under 24-hour surveillance using ORSANCO robot monitor units.

Supplemental data are obtained from the Federal Water Pollution Control Administration, which periodically makes analyses on trace elements and radioactive substances.

Basic data on river flow are furnished by the U. S. Geological Survey, which operates a network of stream-gaging stations. This is supplemented by infor-

ORSANCO WATER QUALITY MONITOR STATIONS

OHIO RIVER STATIONS

	Mile Point	Type
Pittsburgh (Reed) Pa.	2.3	B
South Heights, Pa.	15.8	A, B, C
Stratton, Ohio	55.0	A, C
Toronto, Ohio	59.1	B
Weirton, W. Va.	62.2	B
Steubenville, Ohio	65.3	B
Power, W. Va.	79.3	B
Yorkville, Ohio	83.6	B
Wheeling, W. Va.	86.8	B
Moundsville, W. Va.	111.0	B
Natrium, W. Va.	119.4	B
Willow Island, W. Va.	161.0	A, B
Parkersburg, W. Va.	183.7	B
New Haven, W. Va.	241.6	A, B, C
Addison, Ohio	260.7	B
Huntington, W. Va.	304.2	A, B
South Point, Ohio	318.0	B
Portsmouth, Ohio	350.7	B
Meldahl Dam	436.2	A, C
New Richmond (Beckjord) Ohio	452.8	A
Cincinnati (Waterworks) Ohio	462.8	A, B
Cincinnati (West End) Ohio	471.3	A
Cincinnati (Anderson Ferry) Ohio	479.1	A
North Bend (Miami Fort) Ohio	490.0	A, B
Aurora, Ind.	496.7	A
Markland Dam	531.5	A, C
Madison (Clifty Creek) Ind.	559.5	A, B
Louisville (Waterworks) Ky.	600.6	A, B
Louisville (Cane Run) Ky.	616.8	A, C
Evansville, Ind.	791.5	A, B
Dam 53	962.7	C

TRIBUTARY STATIONS

	Mile at which tributary enters Ohio River	Miles from sampling station to confluence of tributary with Ohio River	Type
Allegheny River near Kinzua, Pa.	0.0	198.0	C
Allegheny River at Oakmont, Pa.	0.0	13.3	A, B, C
Allegheny River at Wilkinsburg, Pa.	0.0	8.9	B
Monongahela River at Point Marion, Pa.	0.0	90.8	C
Monongahela River at Charleroi, Pa.	0.0	42.6	A, B
Monongahela River at South Pittsburgh, Pa.	0.0	4.5	B, C
Beaver River at Beaver Falls, Pa.	25.4	5.3	A, B
Muskingum River at Philo, Ohio	172.2	66.8	B
Muskingum River near Beverly, Ohio	172.2	28.0	A, B, C
New River at Glen Lyn, W. Va.		193.9	B
Kanawha River at Cabin Creek, W. Va.	265.7	74.3	B
Kanawha River at Winfield, W. Va.	265.7	31.1	A, C
Big Sandy River near Louisa, Ky.	317.1	20.3	A, B
Little Miami River at Cincinnati, Ohio	463.5	3.4	A
Licking River at Kenton County, Ky.	470.3	4.5	A
Great Miami River near Cleves, Ohio	491.1	5.5	A
Wabash River near Hutsonville, Ill.	848.0	174.0	A, C

mation from the Cincinnati River Forecast Center of the ESSA Weather Bureau. Forecasts from the Weather Bureau, which are made daily, include estimates on volume and velocity of flow for the current day and for each of the next three days.

In the following sections of this report, observed river conditions, as measured by specific quality characteristics, are matched against criteria adopted by ORSANCO for judging the suitability of river water for various uses.

QUALITY CONDITIONS IN THE OHIO RIVER

Quality analyses made during 1968 reveal that of the twenty-one chemical and bacteriological criteria adopted by ORSANCO for appraising river quality conditions, fourteen (involving 12 substances of quality characteristics) were met one hundred percent of the time at all monitor stations on the Ohio River. Characteristics for which criteria were met at all times include the following: Radioactive materials, temperature (for both aquatic life and industrial water supply), dissolved solids (for both public and industrial water supply), arsenic, barium, cadmium, chromium, cyanide, fluoride, lead, selenium, silver.

Quality characteristics that fell short of meeting the ORSANCO criteria at some times and at some places include the following: dissolved oxygen (two criteria: aquatic life and industrial water supply), coliform bacteria (two criteria: public water supply and recreation), hydrogen-ion concentration (pH) (two criteria: aquatic life and industrial water supply), threshold odor (one criterion: public water supply).

The dissolved oxygen (DO) criterion for aquatic life was met, on the average, about 90 percent of the time (considering data from all stations collectively), and the DO criterion for industrial water supply was met 95 percent of the time or better at all stations.

Monthly-average coliform densities met the ORSANCO criterion for public water supply for three months of the year at Steubenville, for eight months at Wheeling, ten months at Huntington, eleven months at Portsmouth, seven months at Cincinnati, eight months at Louisville, and one month at Evansville.

Monthly-average coliform densities met the criterion for recreational use in one of the five recreation months (May through September) at Cincinnati, in two of these months at Louisville, and in none of the months at Steubenville, Wheeling, Huntington, and Evansville.

The ORSANCO pH criteria were met for aquatic life and industrial water supply 100 percent of the time at Huntington, Cincinnati, Miami Fort and Louisville. Values of pH less than 5.0 (the lower limit specified in the criteria) were registered on five days at South Heights and on six days at Stratton. At Cane Run, values greater than 9.0 (the upper limit specified in the criteria) were observed on 25 days.

Specifications in the ORSANCO criteria covering threshold-odor levels for public water supply were met 100 percent of the time at four of the five monitor locations where this characteristic is measured. At Huntington, threshold odors exceeded the specified upper limit of 24 on five days during the year: the maximum level recorded at this station was 90.

Samples taken at stations monitored by the U. S. Geological Survey showed no excessive or unusual concentrations of minor elements, heavy metals or radicals. Determinations of MBAS (an indication of pollution by detergents) showed such infinitesimal amounts that testing for this contaminant was abandoned in June of 1968.

Alkalinity values in the Ohio River ranged from three to 110 mg/1. Monthly-average values ranged from 18 to 72 mg/l. The lowest recorded alkalinity was at Moundsville, West Virginia, the highest at New Haven. In general, the lower alkalinity values are found upstream, the higher ones downstream. Monthly average alkalinity was 21 mg/l at South Heights: at Evansville it was 72 mg/l.

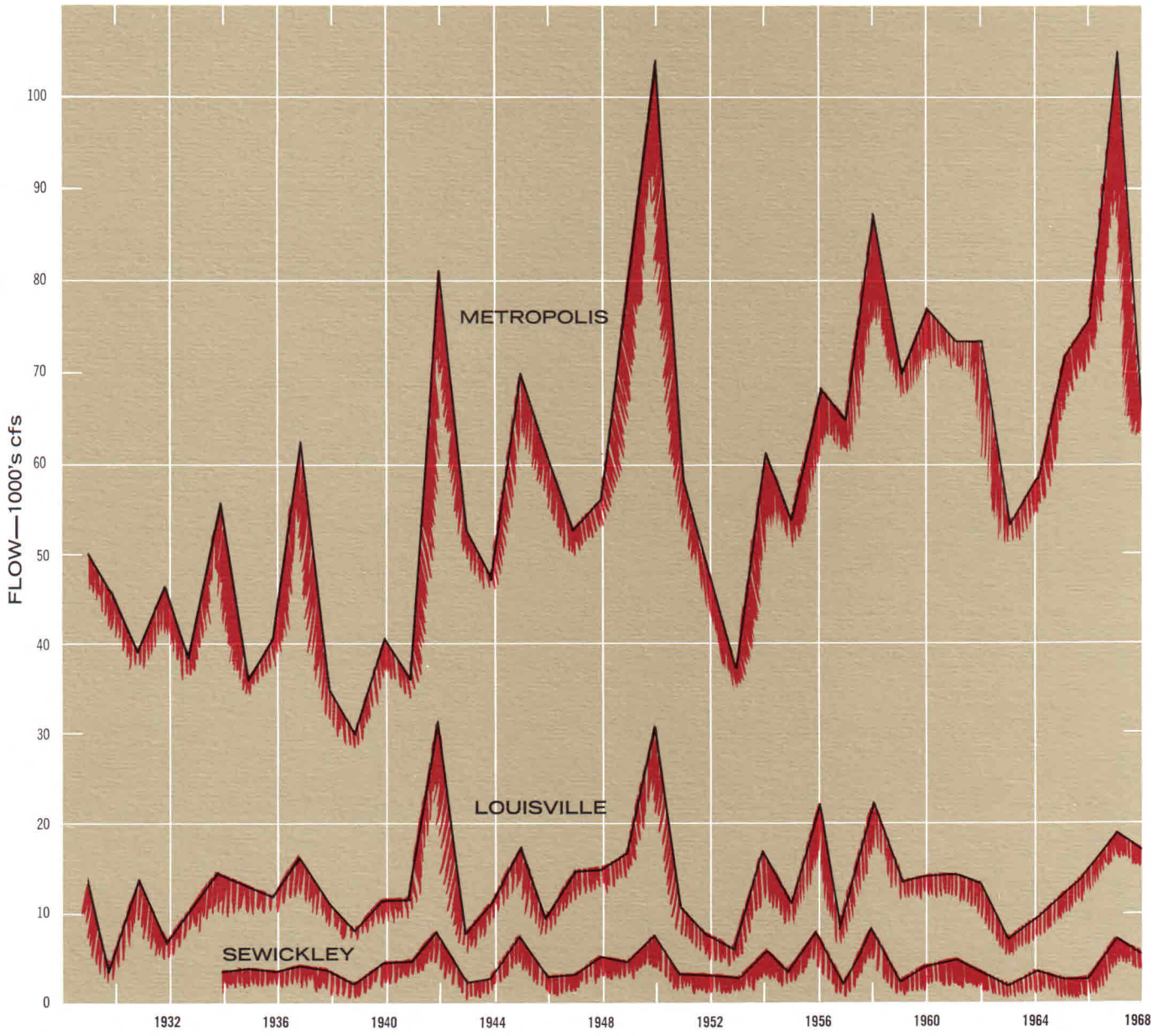
Hardness-producing characteristics, when compared on a monthly-average basis, ranged from 104 mg/l at the Reed Power Plant, Pennsylvania, to 170 mg/l at Parkersburg. These values correspond to the "moderately-hard" classification of the U. S. Geological Survey.

RIVER FLOW — The accompanying chart shows minimum monthly-average flows that have occurred each year over a period of 34 to 37 years at three Ohio River gaging stations. The stations for which data is presented include Sewickley at mile 12, Louisville at mile 607, and Metropolis at mile 944.

The chart shows that although minimum monthly-average flows fluctuate rather widely from year to year, there is a cyclic pattern in the occurrence of exteme values. For example, year in which extremely low monthly-average flows have occurred are 1930-31, 1939, 1953 and 1963. Over past years, then, the interval between the occurrence of extreme values has varied from eight to fourteen years, with the average interval being about eleven years.

The chart further shows that minimum monthly-average flows reached a peak in 1967 at all three stations. This finding further corroborates the occurrence of extreme values (high and low) in a cyclical period of about eleven years.

MINIMUM MONTHLY-AVERAGE FLOWS AT THREE OHIO RIVER GAGING STATIONS IN EACH YEAR DURING THE PERIOD 1929 to 1968



In the upper (Sewickley gage) and middle (Louisville gage) reaches of the river, minimum monthly-average flows in 1968 were only slightly less than corresponding flows in 1967. In the lower (Metropolis gage) reach of the river, however, the minimum flow in 1968 was about 40 percent less than that in 1967.

Generally, river quality conditions are poorest during periods of low flow, simply because there is less water available for dilution. Since minimum monthly-average flows in the upper and middle reaches of the river in 1968 were quite similar to those in 1967, quality conditions in these reaches were also quite similar during the critical (low-flow) period of the two years. Although flow conditions in the lower reach of the river were not as favorable in 1968 as they were in 1967, all quality characteristics measured in that reach during 1968 were well within criteria specifications.

VISIBLE ASPECTS OF POLLUTION — Forty-five incidents of visible, or "obvious" pollution were reported from surveillance operations conducted by state agencies and ORSANCO during 1968. This number was about three-quarters the number of similar incidents reported in 1967.

Incidents of obvious pollution in 1968 included: 12 fish kills, 11 spills of oil and other petroleum products, 20 incidents of objectionable appearance (color, debris, foam, by-passed raw sewage), and two complaints of unpleasant taste and odor in public water supplies.

None of the fish kills occurred on the Ohio River main stem. Tributary basins in which kills were reported included the Allegheny, Monongahela, Wabash and Kanawha.

Causes of fish kills were attributed to: insecticides, refinery wastes, cyanides, fermentation liquors, liquid fertilizer, petroleum products, by-passed sewage and other oxygen-consuming materials.

Causes of spills in which oil and other petroleum products were involved included: accidental damage to a barge, failure of a lagoon, operations at petroleum processing plants (2), operations at transfer stations (7).

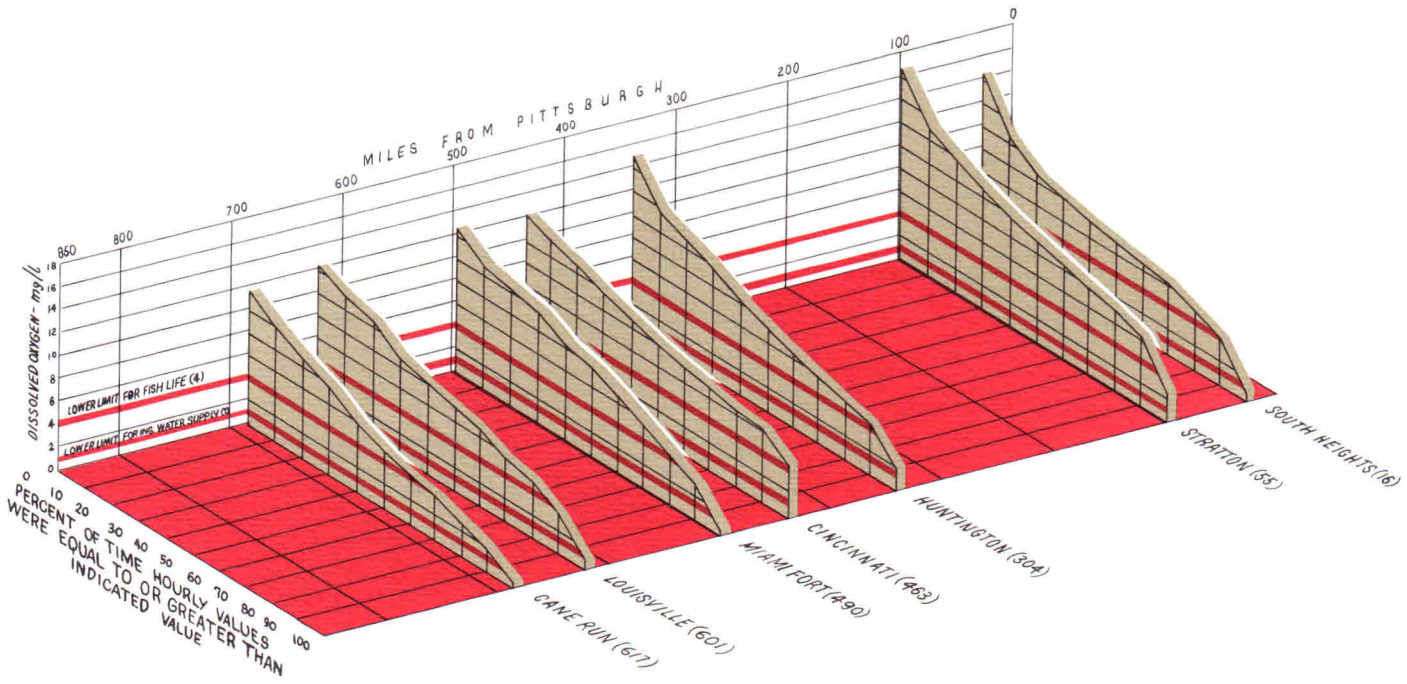
Each of the incidents of obvious pollution were investigated by a representative of the state involved or the ORSANCO staff. Where responsibility could be fixed, steps were taken by state control agencies to eliminate or minimize chances of recurrence.

DISSOLVED OXYGEN — Criteria employed by ORSANCO in 1968 for evaluating river conditions with respect to the maintenance of aquatic life specify that DO concentrations should not be less than 5.0 mg/l during at least 16 hours of any 24-hour period, nor less than 3.0 mg/l at any time. The ORSANCO Aquatic Life Advisory Committee has concluded that if DO concentrations never go below 4.0 mg/l stream conditions may be regarded as meeting the more detailed specification of 5.0 and 3.0 mg/l for respective time periods.

On the basis of this interpretation, the percent of time the DO criterion was met at various stations can be readily determined from the accompanying qualigrams. For example, the results for Cincinnati show that DO concentrations at that location met the criterion 100 percent of the time. At other locations the criterion was met as follows: Stratton, 98 percent of the time; South Heights and Huntington, 92 percent; Louisville, 87 percent; Miami Fort, 83 percent; Cane Run, 65 percent.

The ORSANCO criteria for industrial-water supply specify that DO concentrations should not be less than 1.0 mg/l at any time, nor less than 2.0 mg/l as a daily average value. The percent of time that hourly DO readings were 1.0 mg/l or greater varied from 96 at Miami Fort to 100 at Stratton, Huntington and Cincinnati. Daily-average values of 2.0 mg/l or greater were recorded 86 percent of the time at Cane Run, 92 percent at Miami Fort, 95 percent at Louisville, 96 percent at South Heights, 100 percent at Stratton, Huntington and Cincinnati.

These findings reveal that if DO specifications contained in the ORSANCO criteria are to be met 100 percent of the time in all reaches of the Ohio River, many of the communities and industries on the Ohio and its tributaries will have to install additional facilities in order to provide greater reduction in biochemical-oxygen-demand (BOD) characteristics than is now being attained. For communities, this will mean, in general, the addition of "secondary" treatment facilities (providing solids removal and 80 to 90 percent BOD reduction) to existing "primary" treatment plants (providing solids removal and 30 to 40 percent BOD reduction). Many of the larger cities on



DISSOLVED-OXYGEN QUALIGRAMS — 1968
(Daily-minimum values)

the Ohio—Pittsburgh, Huntington, Portsmouth, Cincinnati, Louisville and Evansville, for example—are already under orders from the states to proceed to secondary treatment, and several of these are well along in their planning phase.

COLIFORM DENSITY — The test for coliform bacteria, which themselves are not disease producing, is a presumptive test indicating the potential presence of fecal and possibly pathogenic organisms. The test may also indicate the presence of bacteria of non-fecal origin, such as those normally found in soil runoff. Therefore, an assessment of whether the density of coliform represents a potential health hazard in a particular location usually cannot be made without the benefit of field surveys to determine whether there are sewage discharges in the vicinity of the sampling point, and the extent to which analytical results are influenced by such discharges.

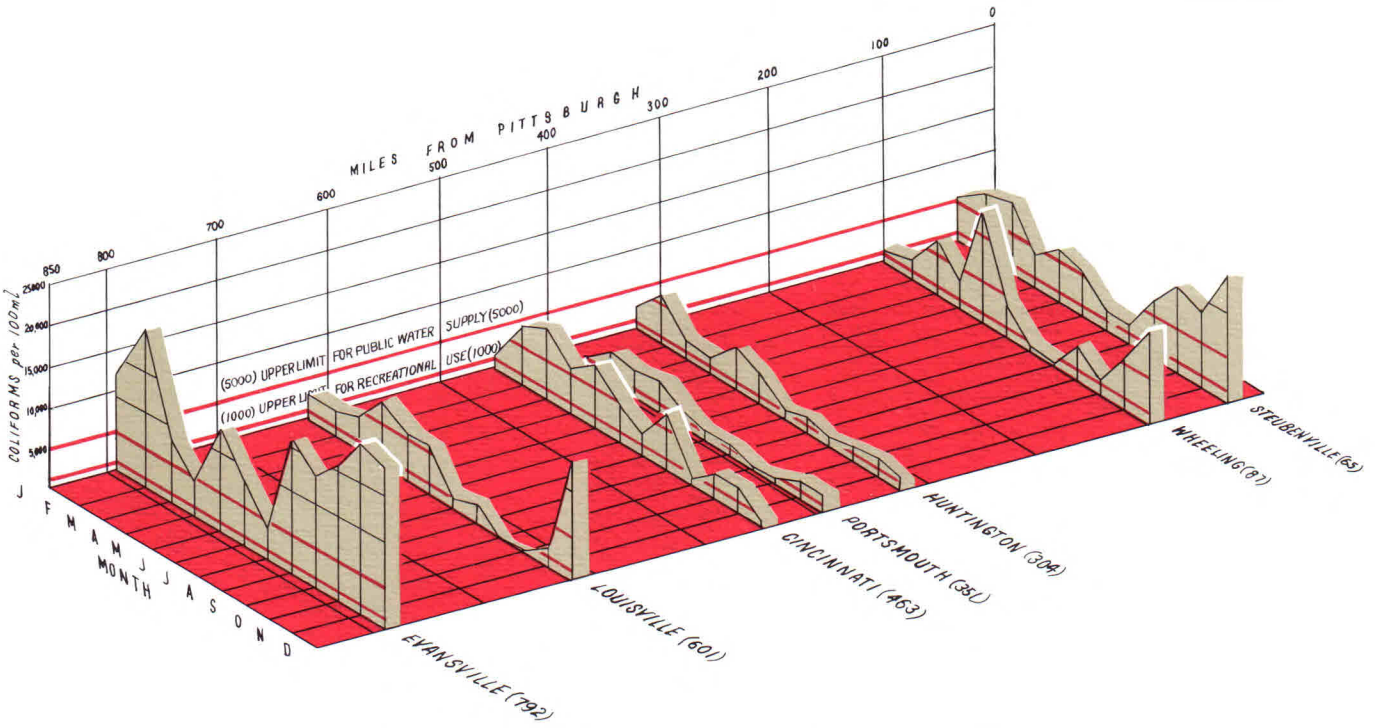
Criteria employed by ORSANCO in 1968 for appraising bacterial quality conditions contain the following specifications:

For Public Water Supply: — (and food processing industry): Coliform group not to exceed 5,000 per 100 ml as a monthly-average value; nor exceed this number in more than 20 percent of the samples examined during any month; nor exceed 20,000 per 100 ml in more than five percent of such samples.

For Recreational Purposes: — Coliform group not to exceed 1,000 per 100 ml as a monthly average value; nor exceed this number in more than 20 percent of the samples examined during any month; nor exceed 2,400 per 100 ml on any day.

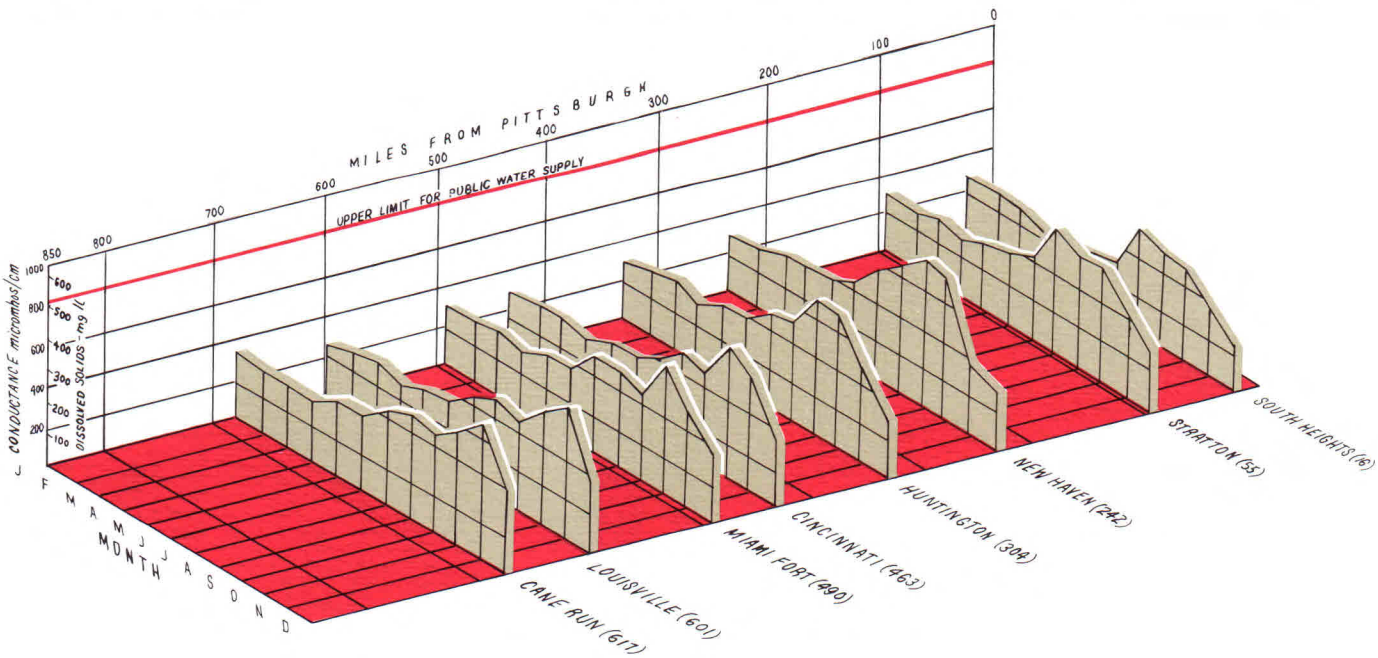
During 1968, coliform densities were measured routinely at seven locations. Findings from these measurements are shown in the accompanying profiles and tables.

With regard to the criterion for public water supply, the profiles show that monthly-average values of 5,000 per 100 ml or less were observed as follows: For eleven months of the year at Portsmouth, for ten months at Huntington, for eight months at Wheeling



COLIFORM DENSITY PROFILES — 1968

(Monthly-average values)



DISSOLVED SOLIDS (CONDUCTANCE) PROFILES — 1968

(Monthly-average values)

and Louisville, for seven months at Cincinnati, for three months at Steubenville and for one month at Evansville. These findings together with information on frequencies at which additional criteria specifications were met are shown in the following tabulation:

Station	Number of months average value less than 5,000/100 ml	No. of months 80% or more of daily values less than 5,000/100 ml	No. of months 95% or more of daily values less than 20,000/100 ml
Steubenville	3	5	5
Wheeling	8	6	8
Huntington	10	7	10
Portsmouth	11	12	12
Cincinnati	7	5	9
Louisville	8	5	10
Evansville	1	0	2

	No. of months during May-Sept. in which			% of days during May-Sept. values less than 2,400/100 ml
Station	Mo. avg. values less than 1,000/100 ml	80% or more of daily values less than 1,000/100 ml	All daily values less than 2,400/100 ml	
Steubenville	0	0	0	48
Wheeling	0	0	0	68
Huntington	0	0	1*	60
Portsmouth	0	0	2	66
Cincinnati	1	0	1	63
Louisville	2	1	1	65
Evansville	0	0	0	22

*2,900 count on 1 day

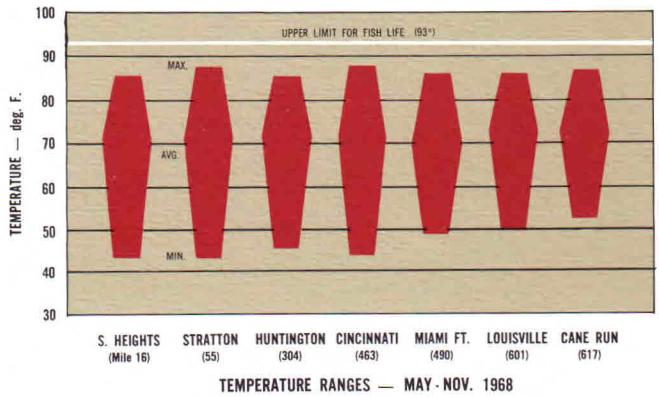
DISSOLVED SOLIDS — The accompanying profiles summarize monthly-average values of specific conductance and dissolved solids at Ohio River monitor stations in 1968. The profiles are based on measurements of specific conductance and conversion of these measurements into dissolved-solids levels in accordance with ratios established by previous correlation studies.

The ORSANCO criteria for public water supply require that dissolved solids shall not exceed 750 mg/l at any time, and shall not exceed 500 mg/l as a monthly-average value. This specification was met at all stations at all times during the year. Since the public water supply criterion for dissolved solids is more strictive than that for industrial water supply, it follows that the latter requirement was fulfilled as well. The highest monthly-average value measured was at New Haven, where the average value for September was 478 mg/l. Also at New Haven, in September, the highest hourly value recorded was 537 mg/l. The maximum values were higher than those recorded in 1967, but they remained well within criterion limits.

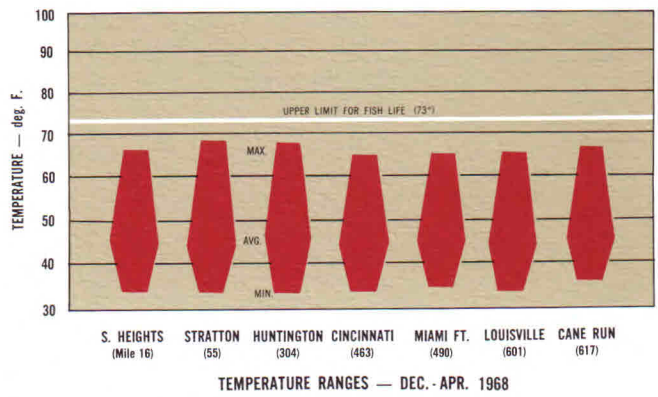
TEMPERATURE — Criteria for temperature were met at all stations at all times during the year, as measured by robot monitors at seven stations. The highest single value, 87.9 deg. F., was measured at Stratton in July.

Individual measurements of temperature and average values for 1968 indicate that there is considerable leeway between actual conditions and the specified limits. ORSANCO monitors are rather widely spaced: however, those that are close together show rapid recovery from heat inputs. This is illustrated, for example, by comparing the relationship between temperature data at Cincinnati and Miami Fort (28 miles apart), and Louisville and Cane Run (16 miles apart).

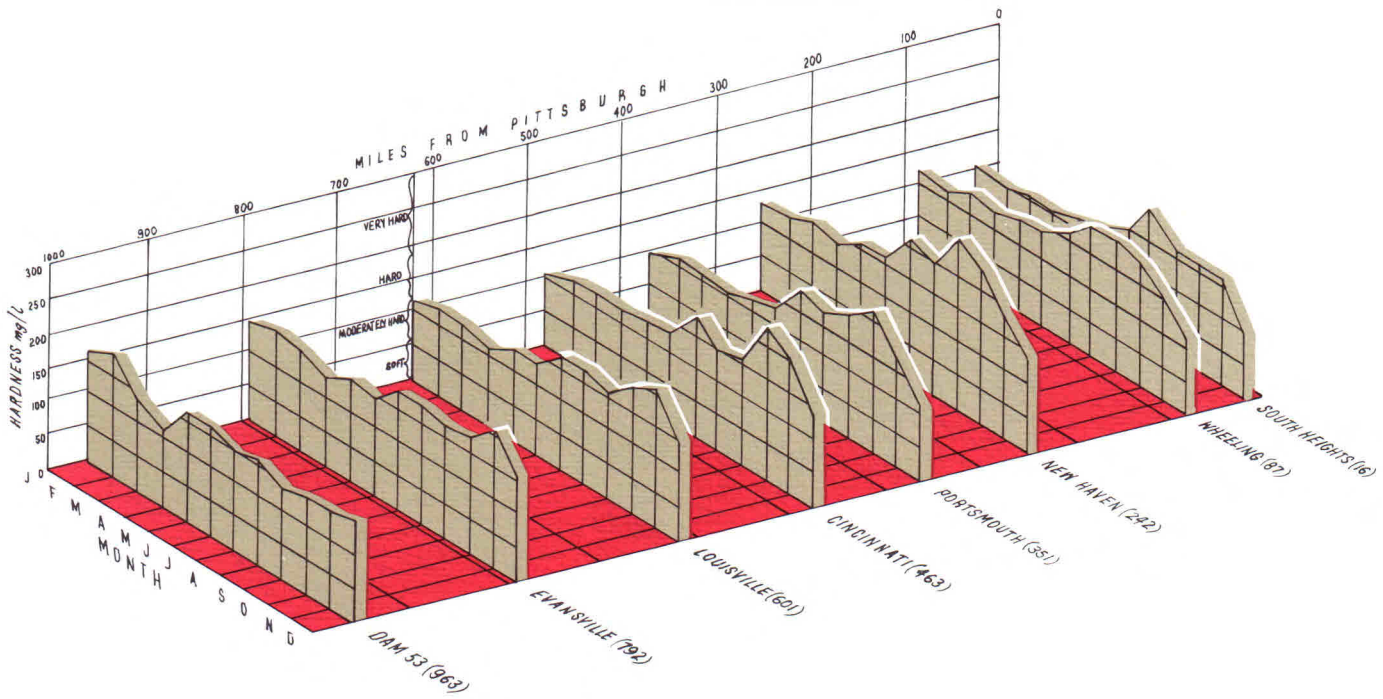
The accompanying table and qualigrams show the thermal characteristics of the river during 1968. The most variable temperature readings were obtained during the spring months. Such wide fluctuations are characteristic of the generally unstable weather conditions and a variation in air temperature and precipitation of that time of year.



TEMPERATURE RANGES — MAY-NOV. 1968

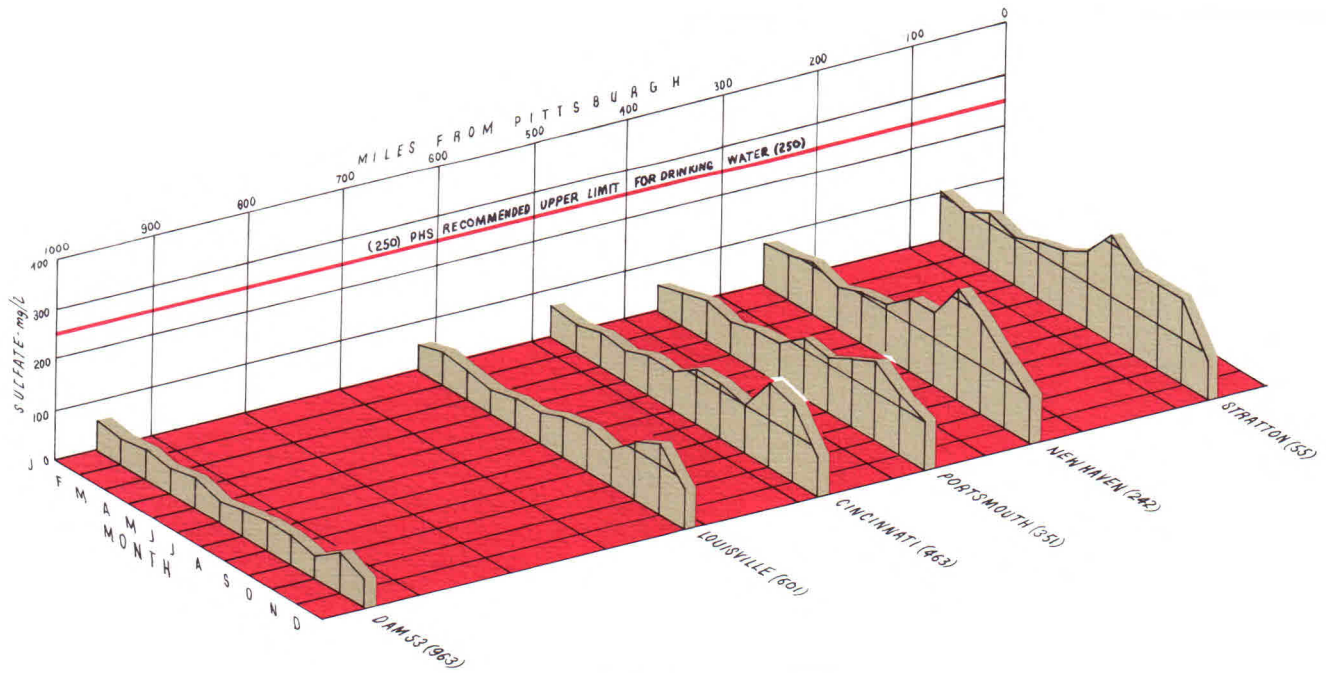


TEMPERATURE RANGES — DEC.-APR. 1968



HARDNESS PROFILES — 1968

(Monthly-average values)



SULFATE PROFILES — 1968

(Monthly-average values)

HARDNESS — Determinations for hardness were made during 1968 at twenty stations on the Ohio River. The relative terms or criteria for hardness as adopted by the U. S. Geological Survey are:

Hardness, mg/l	Water Quality
0 to 60	Soft
61 to 120	Moderately hard
121 to 180	Hard
Greater than 180	Very hard

Virtually the entire Ohio River basin is a hard-water area. Characteristically, therefore, the analyses show the Ohio River to be "moderately hard" to "hard." At some stations during portions of the year, the water is very hard. As might be expected, the times when river water is likely to be hardest are the months of lowest flow, August, September and October.

The ratio of permanent (or non-carbonate) hardness to total hardness is highest in the upper reaches of the Ohio River (upstream from Wheeling), where the ratio at times may be as great as 90 percent. Progressively, going downstream, permanent hardness is displaced by carbonate hardness. Near the mid-point of the river (Louisville) non-carbonate hardness dropped to approximately 60 percent of total hardness. Near the mouth of the Ohio River (Dam 53) non-carbonate hardness during 1968 was in the 20 to 40 percent range.

Louisville's water supply, taken from the Ohio River, is treated for hardness with the objective being to limit the hardness content of the finished water to 120 mg/l. For two months during 1968 analyses of river water at Louisville showed an average hardness content of less than 120 mg/l.

SULFATE — U. S. Public Health Service recommended upper limit for sulfate in drinking water is 250 mg/l. Water high in sulfate is more likely to be found in the upper Ohio than in the lower part of the river. New Haven, in September 1968, had the year's highest monthly average sulfate content, 224 mg/l. The lowest monthly average value was 51 mg/l, recorded in June at Dam 53.

As these figures and the qualigrams show, maximum sulfate levels measured on the main stem are well below the recommended ceiling.

RADIOACTIVE SUBSTANCES — The Federal Water Pollution Control Administration (FWPCA) maintains sampling stations for monitoring radioactive substances in the waters of the Ohio River basin. ORSANCO criteria for public water supply specify that the following values of radioactivity expressed in terms of picocuries per liter (pCi/l), shall not be exceeded:

Gross beta activity	1,000 pCi/l
Dissolved alpha emitters	3 pCi/l
Dissolved strontium-90	10 pCi/l

For inclusion in this report, FWPCA supplied advance information on radioactivity analyses of 458 samples taken from the Ohio River and tributary streams. Results of analyses, in pCi/l, are summarized in the following tabulation:

	Dissolved	Suspended	Total
Beta	0 to 28	0 to 44	0 to 49
Alpha	0 to 5	0 to 36	0 to 36

A dissolved-alpha emission of 5 pCi/l was found in one sample. This finding was not confirmed by retest or duplicate sample, and subsequent samples taken from the same location have shown emissions of less than 3 pCi/l. Dissolved-alpha emissions in all other samples collected in 1968 were within criteria specifications.

Strontium-90 concentrations were at a very low level —less than one-tenth of the maximum specified in the criteria.

METHYLENE-BLUE ACTIVE SUBSTANCES — The test for methylene-blue active substances (MBAS) is a measure of the apparent concentration of synthetic detergent. The soap and detergent subcommittee of the ORSANCO Chemical Industry Committee maintained regular sampling and surveillance at two stations on the Ohio River, at Willow Island and at Anderson Ferry. Tests on samples at these stations indicated that the concentration of these substances had been diminishing month by month. In all cases, values were well below the upper limit of 0.5 mg/l specified in U. S. Public Health Service standards for drinking water. The maximum concentration observed was 0.1 mg/l. Since there appeared to be no further need for regular monitoring of these substances, MBAS tests were discontinued in mid-1968.

CHLORIDE — All chloride values recorded were well below the 250 mg/l upper limit recommended by the U. S. Public Health Service for drinking water. The maximum monthly-average value for 1968, 105 mg/l, was recorded in September at Evansville. The lowest monthly-average during the year was 13 mg/l, which value was observed both at South Heights and at Dam 53.

pH CHARACTERISTICS — The accompanying chart shows ranges in pH values during 1968.

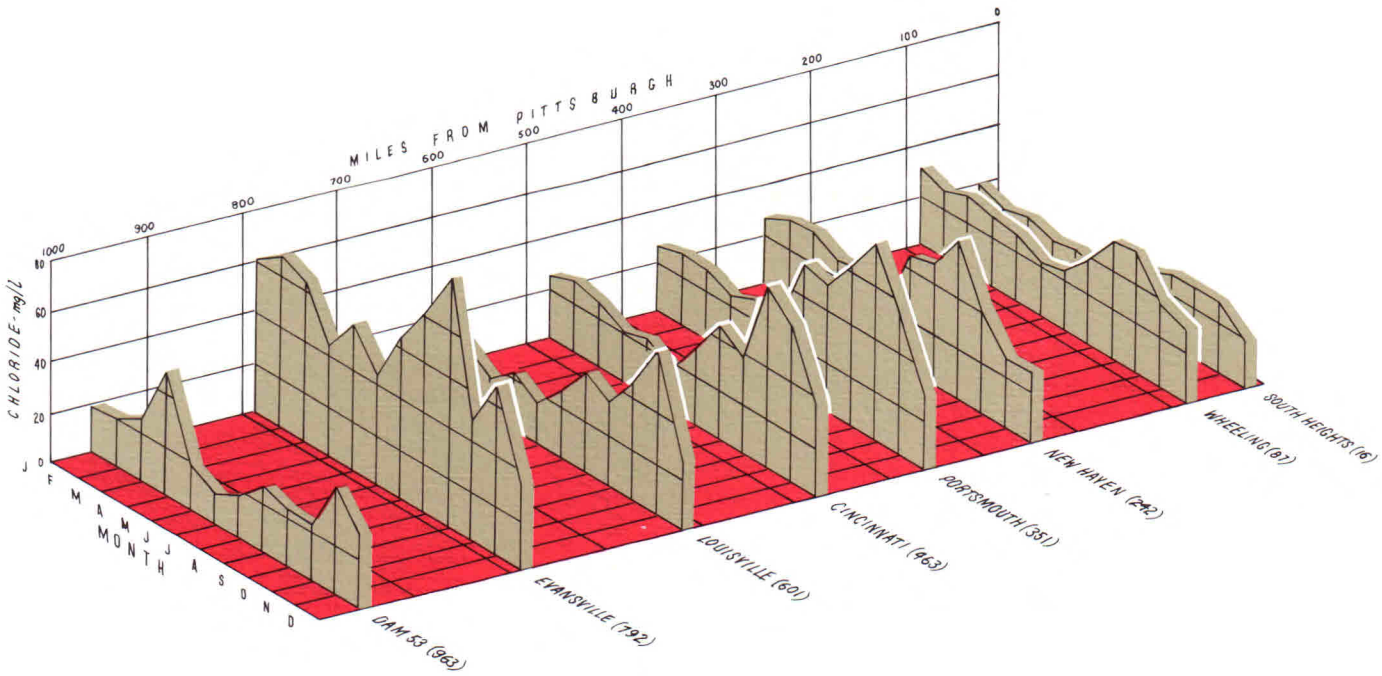
ORSANCO criteria used for the appraisal of river conditions in 1968 specify that for the maintenance of a well-balanced, warm-water fish population pH values should be maintained within the range of 5.0 to 9.0, and preferably within the range of 6.5 to 8.5.

In 1968, pH values were within the 5.0-to-9.0 range 100 percent of the time at Stratton, Huntington, Cincinnati, Miami Fort and Louisville. At South Heights, no values greater than 8.76 were observed; however, values of less than 5.0 were observed on 5 days. At Cane Run, there were no values less than 5.0, but values greater than 9.0 were observed on 4 days during the year.

IRON — Regular monitoring for iron was conducted at four stations, with these results:

Station	Yearly average, mg/l	Remarks
Stratton	0.43	Highest value: 1.9 mg/l
New Haven	0.28	
Louisville	0.41	
Dam 53	0.37	Lowest value: 0.03 mg/l

At the present time, no criterion for iron concentrations has been established by ORSANCO. The Commission's engineering committee has reached the decision that there is insufficient information at this time to establish such a criterion. In addition, deliberations of the ORSANCO Aquatic Life Advisory Committee have led that group to conclude that the setting of criteria for iron and manganese at this time would not serve any meaningful purpose.



CHLORIDE PROFILES — 1968
(Monthly-average values)

MANGANESE — Determinations for manganese were made on a regular basis at four stations on the main stem of the Ohio River during 1968, with the following results (in mg/l):

Station	Minimum	Average	Maximum
Stratton	0.10	0.44	1.80
New Haven	0.06	0.34	0.89
Louisville	0.06	0.18	0.29
Dam 53	0.01	0.07	0.20

These figures show that manganese concentrations progressively decrease going down river. Maximum and average values in 1968 were about 50 percent and 30 percent less, respectively, than corresponding values in 1967.

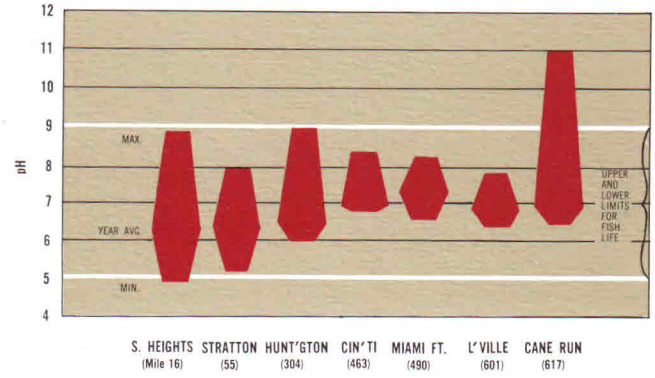
ALKALINITY — Data from four monitor stations showed alkalinity concentrations (in mg/l) in the Ohio River during 1968 as follows:

	Stratton	New Haven	Louisville	Dam 53
Max.	36	80	83	133
Aver.	18	44	70	105
Min.	06	21	52	54

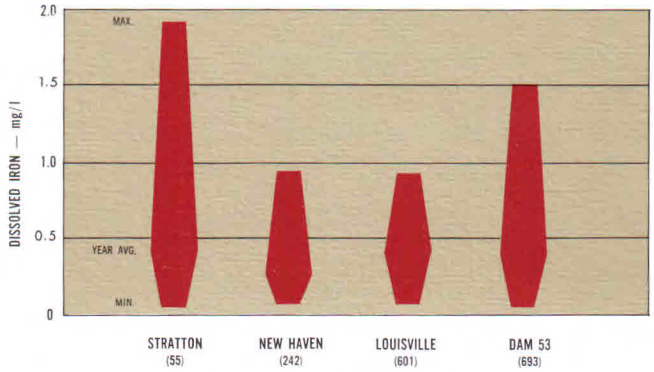
Low levels of alkalinity in the upper river, as shown by data for Stratton and New Haven, can be attributed in large part to the presence of acid mine drainage, particularly from tributary waters. Alkalinity was high in the lower river, averaging 105 mg/l at Dam 53. At Louisville the average of one determination for each of three months (October, November, December) was 70 mg/l. These values contrast strongly with the near nil alkalinity of the lower Monongahela and Allegheny rivers.

NITRATE — Concentrations of nitrates in 1968, as revealed by monitor data, were considerably lower than values in 1967. Average values in 1968 were 5.2 mg/l at Stratton, 4.2 mg/l at New Haven, 9.7 mg/l at Louisville and 5.0 mg/l at Dam 53. All of these values are well within the U. S. Public Health Service recommended standard of 45 mg/l for drinking water.

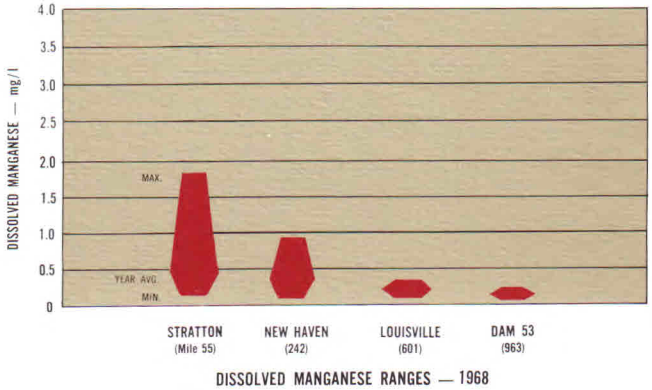
PHOSPHATE — Determinations of phosphate were made on samples taken at Stratton, New Haven, Louisville and Dam 53. The highest value, 0.73 mg/l,



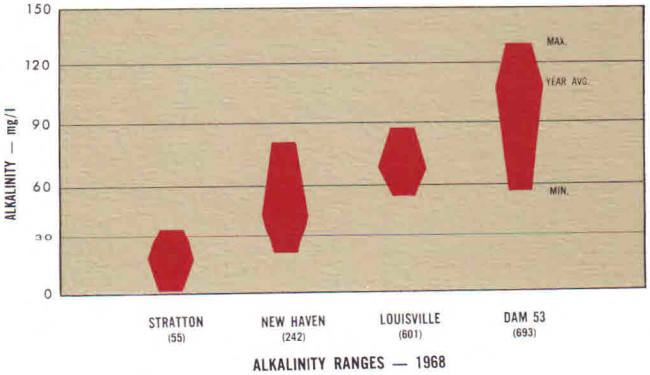
pH RANGES — 1968



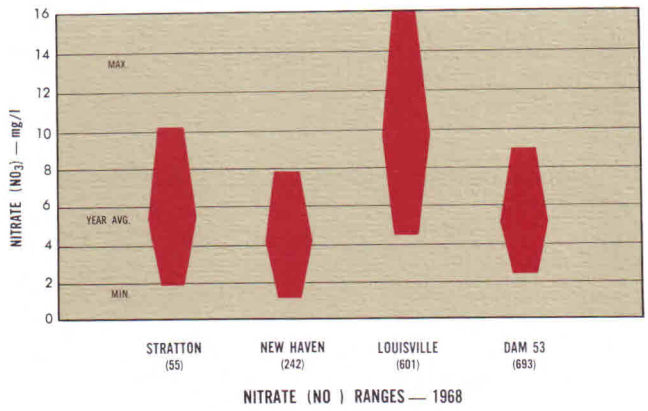
DISSOLVED IRON RANGES — 1968



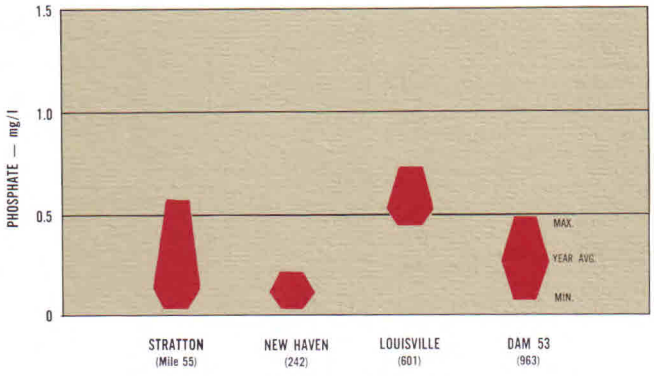
DISSOLVED MANGANESE RANGES — 1968



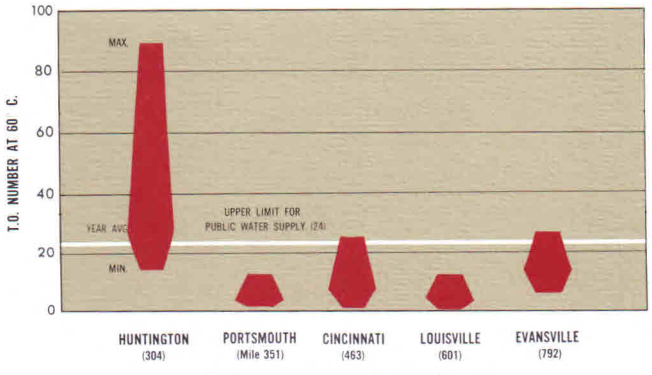
ALKALINITY RANGES — 1968



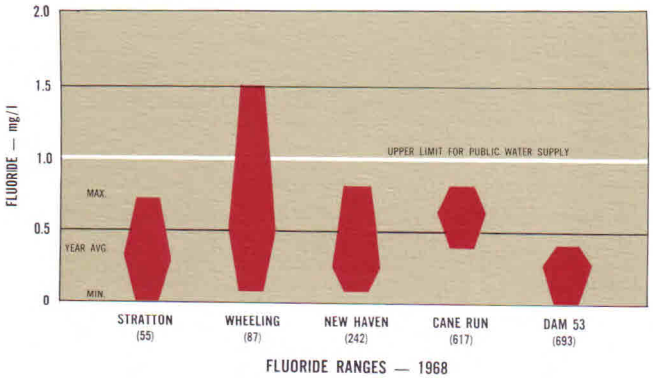
NITRATE (NO) RANGES — 1968



PHOSPHATE RANGES — 1968



THRESHOLD-ODOR NUMBER RANGES — 1968



FLUORIDE RANGES — 1968

was measured at Louisville. The average of nine samples taken at that station over a three-month period (October-December) was 0.51 mg/l. Annual average value at other stations were: 0.13 mg/l at Stratton, 0.12 mg/l at New Haven, and 0.24 mg/l at Dam 53. Maximum and annual average values tended to be lower in 1968 than in 1967.

THRESHOLD-ODOR CONDITIONS — The ORSANCO criteria for public water supply specify that threshold-odor numbers should not exceed 24. This specification was met at all times at all stations except Huntington. At Huntington, the criterion was met throughout the period of June through October; however values greater than 24—ranging up to 90 were observed on occasion during the other months of the year.

OTHER CHEMICAL CONSTITUENTS — All natural waters contain minor but important elements. Some waters are further altered by drainage from domestic, agricultural and industrial activities that bring in additional elements or add to the concentration of elements already present.

ORSANCO criteria and U. S. Public Health Service standards define limiting concentrations for certain metallic and non-metallic substances in public water supplies. The following table shows limits that have been prescribed, together with maximum concentrations (in mg/l) observed at four locations on the Ohio River during 1968.

Constituent	Specified limit	Stratton	New Haven	Louisville	Dam 53
Arsenic	0.05	0.01	0.00	0.01	0.01
Cadmium	0.01	0.00	0.00	0.00	
Chromium	0.05	0.00	0.00	0.01	
Cobalt	*	0.01	0.00	0.00	
Copper	1.00	0.02	0.04	0.04	
Fluoride	1.00	0.70	0.80	0.80	0.60
Lead	0.05	0.02	0.02	0.02	
Nickel	*	0.02	0.02	0.01	
Zinc	5.00	0.14	0.06	0.06	

*Not specified

The table shows that none of the substances measured was found in excess of recommended limits at any of the stations. In fact, maximum concentrations were for the most part, only a small fraction of such limits.

In previous years, Ohio River water was monitored for silver, barium, selenium and cyanide. However,

since concentrations were found consistently to be very low monitoring for these substances has been discontinued.

FLUORIDE — Data on fluoride concentrations is available from the Water Users Committee station at Wheeling, where analyses are made daily, and from USGS-ORSANCO cooperative stations at Stratton, New Haven, Cane Run and Dam 53, where analyses were made on samples taken three times a month.

Ranges in concentration during 1968 are shown in the accompanying graph. With one exception all concentrations were less than 1.0 mg/l, which is the upper limit specified in the ORSANCO criteria for water supply. The highest single value of 1.5 mg/l and the highest monthly-average value of 0.80 mg/l occurred at Wheeling.

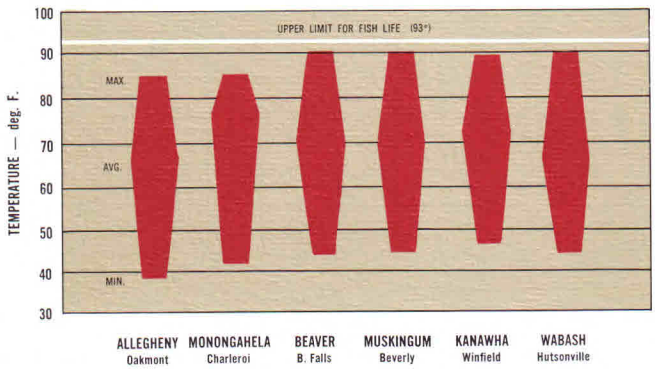
QUALITY CONDITIONS IN TRIBUTARIES

In general, quality conditions in tributary streams during 1968 were similar to what they had been in previous years. The water of the Monongahela basin continues to be high in sulfates, iron and manganese. The Muskingum still contains high concentrations of chloride, hardness and dissolved solids. The Kanawha has perennial low-oxygen conditions. The Allegheny in 1968 continued to show an improvement in conditions that began after completion of the Kinzua Reservoir in 1967.

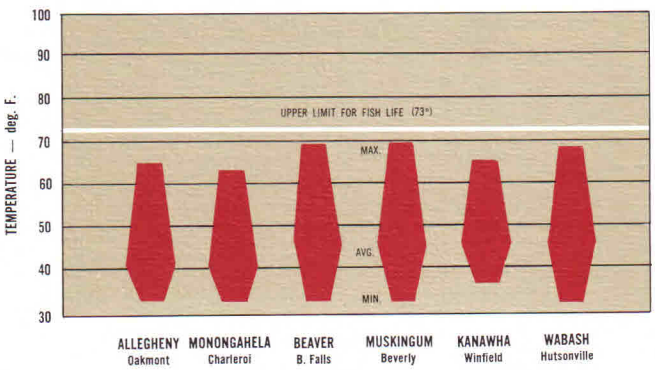
TEMPERATURE — Hourly recordings of temperature were made at six ORSANCO monitor stations located on tributaries. Readings at all stations met ORSANCO criteria during the year.

During the period of May through November the maximum hourly water temperature recorded was 90 deg. F., which value was observed in August on the Beaver River at Beaver Falls. The range in maximum monthly-average temperatures, May through November, was 80.5 to 84.7 deg. F., the highest monthly-average, 84.7 deg. F., being on the Kanawha. Monthly-average minimum values in this period ranged from 45.8 to 53.9 deg. F. The lowest individual reading, 38.9 deg. F., occurred on the Allegheny in November.

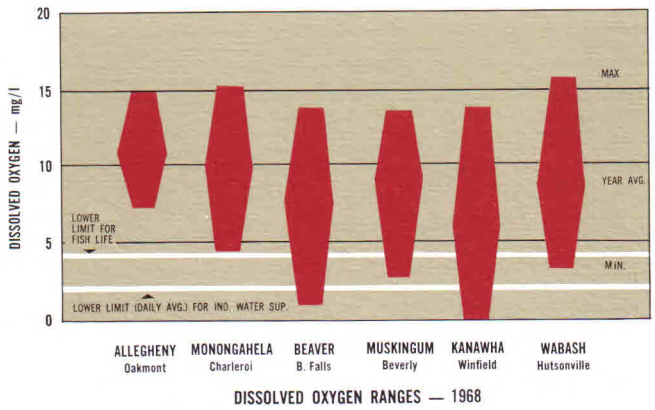
For the winter-spring season (December through April), the maximum hourly temperature, 69.6 deg. F., was recorded on the Muskingum River in April. This tributary also had the highest maximum daily-average temperature, 63.2 deg. F. The range in maximum daily-average values was 55.0 to 63.2 deg. F. The December-April monthly-average values ranged from 39.7 deg. F. on the Allegheny to 45.0 deg. F. on the Kanawha and Wabash.



TEMPERATURE RANGES — MAY - NOV. 1968



TEMPERATURE RANGES — DEC. - APR. 1968

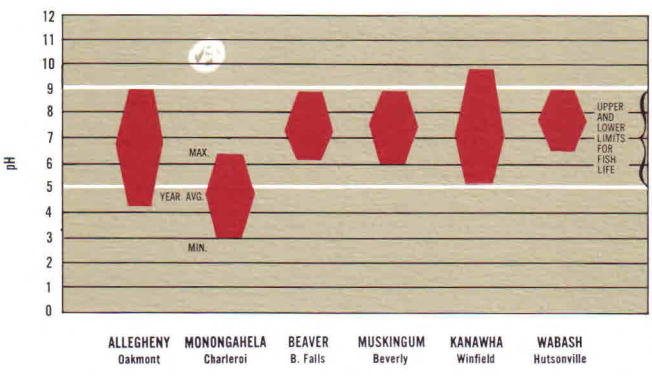


DISSOLVED OXYGEN RANGES — 1968

DISSOLVED OXYGEN — Dissolved oxygen was measured hourly at six tributary locations by means of robot monitors. The accompanying chart shows ranges in DO levels during 1968 at these locations.

Daily-minimum DO concentrations were greater than 4.0 mg/l—the minimum level considered satisfactory for the maintenance of a well-balanced, warm-water fish population—on 100 percent of the days in the Allegheny and Monongahela rivers, 99 percent in the Wabash, 96 percent in the Muskingum, 93 percent in the Beaver and 61 percent in the Kanawha.

Daily-average concentrations were greater than 2.0 mg/l—the minimum level specified in the industrial water supply criteria—on 100 percent of the days at stations on the Allegheny, Monongahela, Wabash and Beaver rivers. On the Muskingum and Kanawha rivers daily-average DO values were greater than 2.0 mg/l for 98 and 84 percent of the days, respectively.



pH RANGES — 1968

pH CHARACTERISTICS — Data from six tributary stations indicate that pH levels generally were within criteria limits of 5.0 to 9.0 except for the Monongahela River.

In the Monongahela, monthly-average pH values were within the 5.0-to-9.0 range for six months of the year—January through May and in December—and outside this range (below 5.0) for the other six months. The lowest individual reading in the Monongahela was 2.96 which occurred in September.

Monthly-average values in the Allegheny River met criteria specifications all through the year. One percent of the hourly readings in August and two percent of the hourly readings in October were below 5.0.

On the Beaver and Muskingum rivers, all measurements were within criteria limits, and tended to be near the neutral point of 7.0.

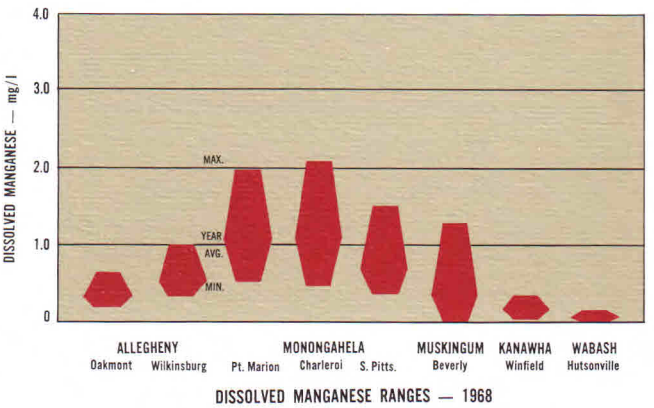
On the Kanawha, all monthly-average values were within the limits of 5.0 to 9.0. There were no readings on the Kanawha less than 5.0. About five percent of the hourly readings during February and March were greater than 9.0.

On the Wabash, monthly-average values were between 5.0 and 9.0 throughout the year. Hourly values greater than 8.5 (none exceeding 9.0 however), were observed during April, May, July, August and September.

ALKALINITY — Alkalinity concentrations in tributary streams in 1968 ranged from zero to 274 mg/l. The following table shows ranges in alkalinity measurements at twelve monitor stations on seven tributaries.

Tributary	Station	Alkalinity (mg/l) Max.	Avg.	Min.
Allegheny	Oakmont	48	20	5
	Wilkinsburg	36	16	4
Monongahela	Charleroi	0	0	0
	So. Pittsburgh	17	4	1
Beaver	Beaver Falls	85	59	30
Muskingum	Philo	125	82	20
	Beverly	150	97	34
Kanawha	Glen Lyn	76	55	37
	Cabin Creek	71	47	22
	Winfield	70	33	14
Big Sandy	Louisa	130	47	6
Wabash	Hutsonville	274	213	84

MANGANESE — Concentration of dissolved manganese declined in 1968 as compared with 1967 in all tributaries except the Monongahela, where there was an increase. The greatest decline was in the Kanawha, from a maximum of 1.8 mg/l in 1967 to a maximum of 0.29 mg/l in 1968. Ranges in manganese levels in 1968 are shown in the accompanying chart.



DISSOLVED MANGANESE RANGES — 1968

COLIFORM DENSITY — Coliform densities were measured at Wilkinsburg on the Allegheny River, at South Pittsburgh on the Monongahela River and at Beaver Falls on the Beaver River.

The extent to which coliform specifications in the ORSANCO criteria for public-water supply were met is shown in the following tabulation, together with information on maximum and yearly-average values:

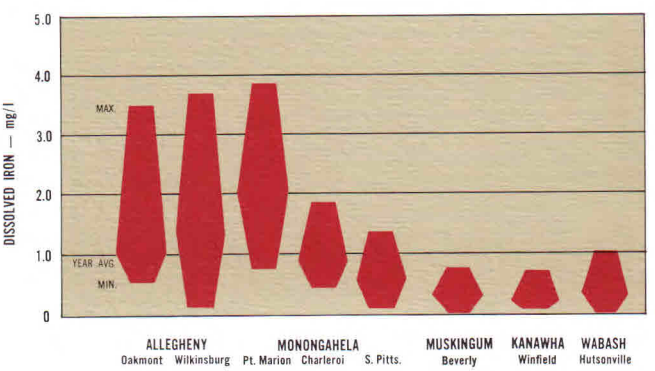
	Wilkinsburg	S. Pittsburgh	Beaver Falls
Number of months in which average coliform counts did not exceed 5,000 per 100 ml	6	12	0
Number of months in which 80 percent or more of daily values were less than 5,000 per 100 ml	6	11	0
Number of months in which 95 percent or more of daily values were less than 20,000 per 100 ml	7	12	0
Maximum monthly—average value (coliforms per 100 ml)	25,400	3,800	56,300
Yearly—average value (coliforms per 100 ml)	6,900	2,100	30,800

The extent to which specifications in the criteria for recreational use were met during the months of May through September is shown in the following tabulation, together with information on maximum and seasonal-average values:

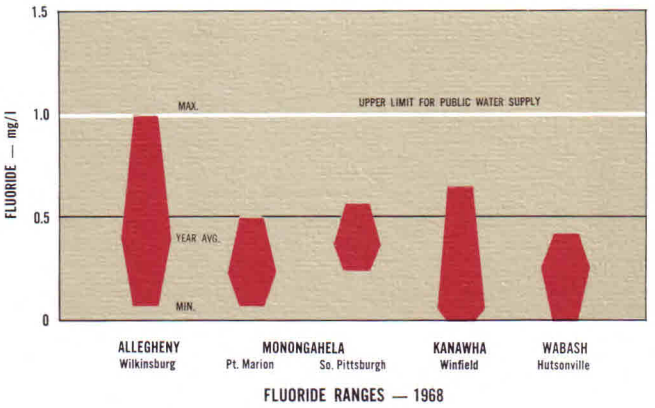
	Wilkinsburg	S. Pittsburgh	Beaver Falls
Number of months in which average coliform counts did not exceed 1,000 per 100 ml	1	1	0
Number of months in which 80 percent or more of daily values were less than 1,000 per 100 ml	0	0	0
Number of months in which all daily values were less than 2,400 per 100 ml	0	0	0
Maximum monthly—average value (coliforms per 100 ml)	13,400	3,800	56,300
Seasonal—average value (coliforms per 100 ml)	5,800	2,500	33,300

FLUORIDE — Concentrations of fluoride in tributaries were lower in 1968 than they were in 1967. The highest concentration observed was 1.0 mg/l, which value was recorded at Wilkinsburg on the Allegheny River. A chart (on the following page) shows maximum, average and minimum values of fluoride concentrations at stations on the Allegheny, Monongahela, Kanawha and Wabash rivers.

IRON — Dissolved iron concentrations were generally lower in the tributaries in 1968 than in 1967, with the exception of the Muskingum River at Beverly where a slight increase was recorded. The Kanawha River at Winfield showed almost a two-thirds decrease in dissolved iron. Lowest concentrations of iron were reported in the Wabash and Muskingum rivers: the highest concentrations were in the Allegheny and Monongahela rivers. The accompanying chart summarizes ranges in iron concentrations during 1968.



DISSOLVED IRON RANGES — 1968



FLUORIDE RANGES — 1968

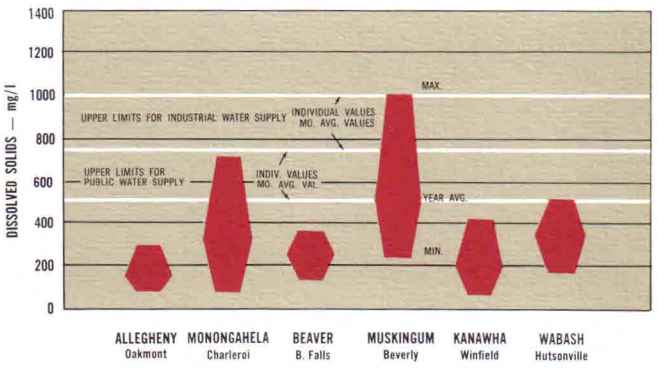
SULFATE — By standards of the U. S. Public Health Service, a sulfate concentration of 250 mg/l is the upper limit of suitability for drinking water. Concentrations in the Monongahela exceeded this limit at times, the maximum value observed being 347 mg/l. The tributary with the next highest concentration of sulfate is the Muskingum, in which a maximum value of 230 mg/l was recorded. Ranges during 1968 in sulfate concentrations at five tributary monitor stations are shown in the accompanying chart.

DISSOLVED SOLIDS — Ranges in dissolved-solids concentrations in the tributaries during 1968 were similar to those in previous years. The industrial-water supply criteria specify an upper limit of 1,000 mg/l on individual values, and a limit of 750 mg/l on monthly-average values. The accompanying chart shows that the highest values during the year occurred in the Muskingum, in which a maximum concentration of 1,063 mg/l and a yearly concentration of 525 mg/l were recorded. The next highest values—710 mg/l maximum and 336 mg/l yearly average—were in the Monongahela.

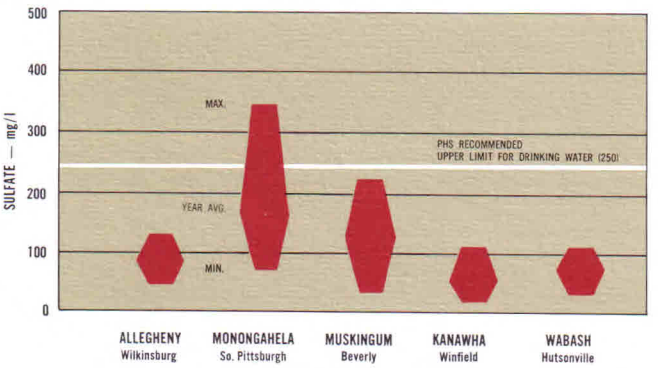
PHOSPHATE — Concentrations in 1968 ranged from zero to 1.1 mg/l. The highest values were found in the Wabash, in which the yearly average concentration was 0.50 mg/l; the lowest were recorded on the Allegheny at Oakmont and on the Monongahela at Point Marion. The table summarizes ranges in phosphate concentrations during the year:

	Maximum	Average	Minimum
Allegheny			
Oakmont	0.11	0.05	0.03
Monongahela			
Pt. Marion	0.09	0.05	0.01
S. Pittsburgh	0.13	0.07	0.01
Kanawha			
Winfield	0.39	0.20	0.00
Wabash			
Hutsonville	1.10	0.50	0.18

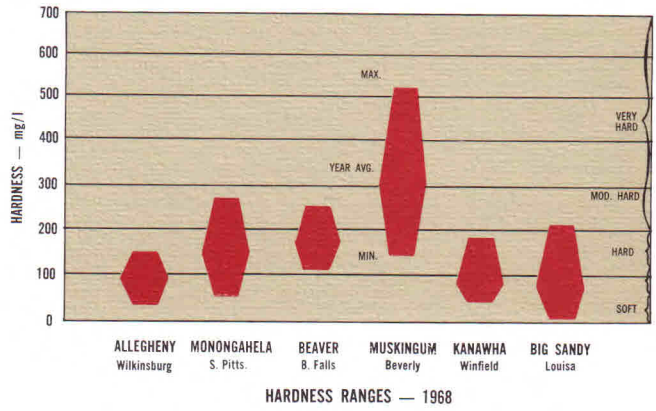
CHLORIDE — Concentrations at all monitor stations except Beverly on the Muskingum were well below the limit of 250 mg/l recommended in U. S. Public Health Service drinking water standards. Ranges in chloride concentrations during 1968 are shown in the accompanying chart.



DISSOLVED SOLIDS RANGES — 1968



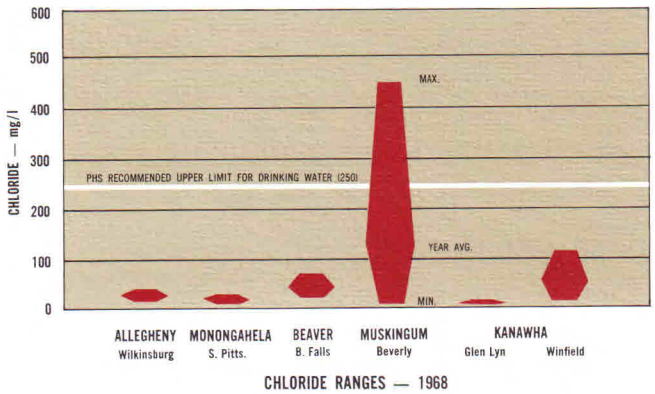
SULFATE RANGES — 1968



HARDNESS RANGES — 1968

NITRATE — Routine analyses for nitrate were made during 1968 on the Muskingum, Kanawha and Wabash rivers. In addition, analyses were made on the Allegheny at Oakmont and at Point Marion and South Pittsburgh on the Monongahela during the months of October through December. The highest value observed during the year was 27.0 mg/l (on the Wabash), which is well below the limiting value of 45.0 mg/l established for drinking water by the U. S. Public Health Service. Ranges in nitrate concentrations (in mg/l) were as follows:

	Maximum	Average	Minimum
Allegheny			
Oakmont	2.7	1.9	1.0
Monongahela			
Pt. Marion	3.3	1.3	0.6
S. Pittsburgh	4.5	3.0	0.9
Muskingum			
Beverly	7.4	5.0	2.0
Kanawha			
Winfield	17.0	7.4	0.1
Wabash			
Hutsonville	27.0	8.8	1.6



CHLORIDE RANGES — 1968

HARDNESS — Samples were taken and tested for hardness on six tributaries on a 12-month basis. Results shown in the accompanying chart, show that water in the tributaries ranged from "soft" to "very hard" on the basis of the following designations used by USGS: Soft—0 to 60 mg/l of hardness; moderately hard—61 to 120 mg/l; hard—121 to 180 mg/l; very hard—greater than 180 mg/l.

OTHER CHEMICAL CONSTITUENTS — Analyses for heavy metals were made in 1968 on six samples taken from the Allegheny and Monongahela rivers during October, November and December. Results are summarized in the following tabulation (concentrations in mg/l):

Constituent	Allegheny River at Oakmont	Monongahela River at S. Pittsburgh
Chromium	0.00	0.00
Nickel	0.00-0.01	0.00-0.03
Copper	0.00-0.02	0.04-0.13
Lead	0.00	0.00-0.01
Zinc	0.00-0.01	0.09-0.23
Cobalt	0.00	0.00-0.02
Arsenic	0.00-0.01	0.00
Cadmium	0.00	0.00

TALLY FOR THE VALLEY

AN ANNUAL INVENTORY on the status of control facilities for sewage and industrial wastewaters is compiled from information submitted by each of the states signatory to the Ohio Valley Compact. The status for the year ending June 30, 1969, is summarized in the accompanying tabulations. Following are highlights revealed by the inventory.

Municipal status — Although 95 percent of the 11.6 million sewered population in the Ohio Basin is now served by treatment facilities, the inventory shows that facilities serving 30 percent of the population must be upgraded in terms of treatment capability in order to meet state water quality standards. Upgrading of some of these facilities (40 communities serving a population of 408,000) was underway on June 30, 1969. Construction was started on fifteen new treatment plants, serving a combined population of about 40,000, and twelve new plants (serving a population of 220,000) were placed in operation during the past year.

Most of the communities on the Ohio River have installed facilities that are now providing either "primary" treatment (removal of solids and reduction in biochemical oxygen demand — BOD — of about 35 percent) or "intermediate" treatment (solids removal and 50 to 60 percent BOD reduction).

Because of the upgrading of river quality standards by the states during the past few years, many of the communities on the Ohio River will have to install additional facilities to provide a higher degree of treatment than can be attained with existing plants. In general, this means that these communities will have to install "secondary" treatment facilities, which will provide for solids removal and 80 to 90 percent BOD reduction. Many of the larger cities — Pittsburgh, Huntington, Portsmouth, Cincinnati, Louisville and Evansville, for example — are already under orders from the states to proceed to secondary treatment and several of these are well along in their planning phase.

Industrial status — Of the 1,842 industrial wastewater discharges to streams in the compact district, 1,600 (87 percent) are complying with the ORSANCO minimum requirements. All but 148 of these 1,600 industries are also complying with all additional requirements imposed on them by individual state pollution control agencies. Of the 13 percent of the industries that are not yet complying with minimum requirements, all but 4 percent have inaugurated pollution-abatement programs and are in various stages of planning, preparation of designs and construction of control facilities.

Basin status — The major tributaries of the Ohio River within the compact district range in size from the Little Kanawha with a drainage area of 1,185 square miles and a sewered population of 11,000, to the Wabash with a drainage area of 33,100 square miles and a sewered population of 1,866,000. The following tabulation shows on a basin-by-basin basis the amount of sewered population, percent of population served by sewage treatment facilities, number of industrial plants and percent of industrial plants complying with minimum control requirements.

Basin	Sewered Population (thousands)	Percent of population served by treatment facilities	Number of industrial plants	Percent of plants complying with minimum requirements
Ohio	3,655	99.5	202	87.6
Allegheny	761	84.1	274	88.0
Monongahela	736	63.2	238	84.4
Beaver	672	99.7	147	90.5
Muskingum	575	98.5	119	92.4
Little Kanawha	11	82.4	8	100.0
Hocking	70	100.0	4	100.0
Kanawha	386	89.7	107	75.7
Guyandot	23	80.5	46	41.3
Big Sandy	64	67.4	80	81.2
Scioto	813	99.6	39	97.4
Little Miami	173	99.5	8	87.5
Licking	48	99.1	4	75.0
Miami	824	99.8	63	95.2
Kentucky	154	98.4	26	100.0
Salt	90	100.0	22	95.4
Green	117	99.3	21	100.0
Wabash	1,873	96.6	260	89.2
Cumberland	98	100.0	17	100.0
Tennessee	113	88.8	23	100.0
Minor tributaries	341	93.2	134	84.3
Total	11,597	94.9	1,842	86.9

STATUS OF MUNICIPAL AND INSTITUTIONAL SEWAGE-TREATMENT FACILITIES—July 1, 1969

Number of communities (top number) and population bottom number)

STATUS	ILL.	IND.	KY.	N. Y.	OHIO	PA.	VA.	W. VA.	TOTAL	% OF TOTAL
Control currently acceptable	**69** 320,987	**158** 1,141,664	**200** 1,252,859	**8** 81,440	**306** 2,713,878	**242** 1,277,780	**48** 155,157	**111** 571,774	**1,142** 7,515,539	**64.0** 64.8
Treatment provided, improvements needed	**7** 24,113	**66** 629,172	**4** 6,202	**6** 16,619	**89** 1,036,393	**92** 1,347,096	**20** 16,266	**2** 1,598	**286** 3,077,459	**16.0** 26.5
Treatment provided, improvements under construction	**1** 8,780	**10** 93,192	**3** 69,832		**6** 22,816	**13** 103,709	**3** 5,633	**4** 103,635	**40** 407,597	**2.3** 3.5
New treatment works under construction		**3** 4,259	**1** 1,611		**2** 3,249	**9** 31,667	**1** 2,456	**5** 11,140	**21** 54,382	**1.2** 0.5
No treatment; construction not started	**7** 8,392	**56** 49,072	**7** 7,544	**2** 9,630	**19** 18,786	**108** 272,383	**13** 13,512	**83** 162,736	**295** 542,055	**16.5** 4.7
TOTAL	**84** 362,272	**293** 1,917,359	**215** 1,338,048	**16** 107,689	**422** 3,795,122	**464** 3,032,635	**85** 193,024	**205** 850,883	**1,784** 11,597,032	**100.0** 100.0

STATUS OF INDUSTRIAL WASTE CONTROL FACILITIES—July 1, 1969

STATUS	ILL.	IND.	KY.	N. Y.	OHIO	PA.	VA.	W. VA.	TOTAL	% OF TOTAL
Complying with ORSANCO minimum requirements	21	258	159	17	346	545	52	202	1,600	86.9
Control currently acceptable	22	235	152	12	274	525	50	182	1,452	78.8
Control facilities inadequate, improvements in progress	4	15			19	10		26	74	4.0
New control facilities under construction	1	1				8		11	21	1.2
Improvements or new control facilities being planned	7	30	11	8	59	53	6	46	220	11.9
No action	5	3	1	11	14	14	1	26	75	4.1
Number of industries	39	284	164	31	366	610	57	291	1,842	100

Chairman N. H. Dyer

ADMINISTRATIVE AFFAIRS

ON JUNE 30, 1948, eight states entered into a compact to cooperate in abating existing pollution and control future pollution of the waters of the Ohio Valley district. The compact "district" includes that portion of the Ohio Valley drainage basin that lies within the boundaries of the following states: Illinois, Indiana, Kentucky, New York, Ohio, Pennsylvania, Virginia and West Virginia.

Discussions on regional cooperation through the use of a compact were initiated in the early 1930's. Authority for the Ohio Valley states to enter into a compact was initially granted by the 74th Congress on June 8, 1936, and approval of the compact in its final form was granted by the 76th Congress on July 11, 1940.

By 1940 the compact had been ratified by the legislatures of six of the eight states (all except Pennsylvania and Virginia). Certain provisions in the state ratification acts, however, prevented the compact from becoming operative until it had been ratified by the remaining two states. Pennsylvania ratified the compact in 1945, and Virginia ratified it on March 5, 1948, to become effective ninety days after adjournment of the General Assembly, which took place on March 13, 1948.

The Ohio River Valley Water Sanitation Commission was established as the agency to administer the provisions of the compact. It is the role of the Commission to coordinate and supplement the efforts of its signatory states in a regional water-pollution control program.

The Commission is composed of twenty-seven members, three from each of the eight signatory states who are appointed by the governor of each state, and three representing the federal government who are appointed by the President of the United States.

Administrative and technical operations are conducted by a small professional staff under the direction of the executive director who is also the chief engineer.

Chairmanship of the Commission is rotated annually among the states. For the fiscal year beginning July 1, 1969, N. H. Dyer, M. D. of West Virginia served as chairman. Dr. Dyer is the state health commissioner of West Virginia. He is one of the original members of the Commission and signed the compact as a West Virginia representative. His is a distinguished record in the field of public health administration. Dr. Dyer's service was recognized in a citation as "West Virginia's greatest leader in the field of Public Health."

Serving with Dr. Dyer as vice-chairman is Lyle W. Hornbeck, one of the commissioners representing the State of New York. Mr. Hornbeck is an attorney with the firm of Bond, Schoeneck and King in Syracuse.

Membership Changes — Dr. Jacob I. Bregman, who as Deputy Assistant Secretary for Water Pollution Control, Department of the Interior, served as a commissioner by Presidential appointment effective February 12, 1968, resigned from government service on May 31, 1969. His successor, Carl L. Klein, was appointed to the Commission on June 11, 1969.

Staff changes — Robert L. Laugel, a data processing technician, joined the staff on March 15, 1969.

The staff consists of the executive director, a chemist-biologist, a chemical engineer, a sanitary engineer, a geologist, an office manager, four technicians and three secretaries. Dr. Edward J. Cleary, former executive director, serves as a consultant.

Financial — Operating funds are derived from two sources: appropriations from the eight states and federal administrative grants. The annual amount received from the states is now $182,000, the amount paid by each state representing a pro rata share based one-half in proportion to population and one-half in proportion to land area within the compact district. In the fiscal year of 1969 the Commission received a federal grant of $167,077 under the Federal Water Pollution Control Act.

A table of distribution of annual shares of the budget and a financial statement will be found on following pages.

The Federal Water Pollution Control Administration has made available to the Commission a three-year grant of about $300,000 for a project entitled "Automated Forecast Procedure for River Quality Management." Of these funds, $138,000 were expended in the first year of the project which ended on December 31, 1969.

Advisory Committees — The Commission makes use of a number of specialist committees. These include: an engineering committee composed of the chief engineers of state pollution-control agencies, together with technical experts from federal agencies; a group of seven industry committees representing chemical, coal, metal-finishing, oil, electric power, paper and steel interests; a water users committee composed of managers of municipal and industrial water treatment plants; and an aquatic life committee that includes scientists and fish-management specialists. In addition, the Commission retains consultants from time to time on special assignments.

CHAIRMEN OF ORSANCO ADVISORY COMMITTEES

(as of December 1, 1969)

Aquatic-Life Advisory Committee — LLOYD L. SMITH, JR., University of Minnesota, St. Paul, Minnesota

Chemical Industry Committee — ROBERT F. ROCHELEAU, E. I. duPont de Nemours & Co., Wilmington, Delaware

Coal Industry Advisory Committee — LARRY COOK, Ohio Reclamation Association, Columbus, Ohio

Metal-Finishing Industry Action Committee — ROBERT G. CLARKE, JR., Hamilton Cosco, Inc., Columbus, Indiana

Petroleum Industry Committee — KENT G. DRUMMOND, Marathon Oil Company, Findlay, Ohio

Power Industry Advisory Committee — R. W. GAUSMANN, Indianapolis Power and Light Co., Indianapolis, Indiana

Pulp and Paper Industry Action Committee — W. C. MATHEWS, Mead Corporation, Chillicothe, Ohio

Steel Industry Action Committee — JOHN R. BROUGH, Inland Steel Company, East Chicago, Indiana

Water Users Committee — C. R. JOHNSON, American Electric Power Service Corp., Huntington, W. Va.

COMMISSION COMMITTEE ASSIGNMENTS

(for the year ending June 30, 1970)

Executive Committee

Chairman	N. H. Dyer, M.D.
Vice-chairman	Lyle W. Hornbeck
Illinois	Clarence W. Klassen
Indiana	Blucher A. Poole
Kentucky	James S. Shropshire
New York	Joseph R. Shaw
Ohio	Raymond H. Fuller
Pennsylvania	Marion K. McKay
Virginia	William H. Singleton
West Virginia	Edgar N. Henry
Federal	Carl L. Klein

Audit

James S. Shropshire, *Chairman*
Luther N. Dickinson
John E. Pearson

Bylaws

Blucher A. Poole, *Chairman*
Lyle W. Hornbeck
Franklin D. Yoder, M.D.

Policy

Raymond H. Fuller, *Chairman*
Edward J. Cleary
Wesley E. Gilbertson
Robert K. Horton
Marion K. McKay
Blucher A. Poole

Finance

Joseph R. Shaw, *Chairman*
Minor Clark
N. H. Dyer, M.D.
Raymond H. Fuller
Lyle W. Hornbeck

Pension Trust

Barton A. Holl
Clarence W. Klassen
Robert K. Horton

Salaries and Personnel

N. H. Dyer, M.D., *Chairman*
Lyle W. Hornbeck
Marion K. McKay

Engineering Committee

Illinois	Clarence W. Klassen
Indiana	Blucher A. Poole
Kentucky	Ralph C. Pickard, *Chairman*
New York	Dwight Metzler, *Vice-Chairman*
Ohio	George H. Eagle
Pennsylvania	Walter A. Lyon
Virginia	A. H. Paessler
West Virginia	Edgar N. Henry
Corps of Engineers	Donald T. Williams
Dept. of Interior	Raymond E. Johnson
FWPCA	Richard A. Vanderhoof
Secretary	Fred H. Waring
Staff	Robert K. Horton

DISTRIBUTION OF ANNUAL SHARES OF BUDGET BY STATES

1960 Census Figures Used as Basis for Determining Annual Shares for Operating Budget

State	Area within Ohio River Drainage Basin		Population (1960) within Ohio River Drainage Basin		Weighted Average of Percentages of Area and Population	Annual Share of Budget (for total budget of $182,000)
	Square Miles	Percent of Total	Population	Percent of Total		
Illinois	10,745	7.0%	591,109	3.2%	5.10%	$ 9,282
Indiana	29,135	18.9	3,227,072	17.3	18.10	32,942
Kentucky	39,375	25.5	2,981,670	16.0	20.75	37,765
New York	1,955	1.3	168,365	0.9	1.10	2,002
Ohio	29,570	19.2	5,702,592	30.6	24.90	45,318
Pennsylvania	15,620	10.1	3,783,796	20.3	15.20	27,664
Virginia	7,175	4.6	457,312	2.4	3.50	6,370
West Virginia	20,610	13.4	1,738,006	9.3	11.35	20,657
TOTALS	154,185	100.0%	18,649,922	100.0%	100.0%	$182,000

FINANCIAL REPORT

The following information relative to revenues collected and expenses paid, and statement of resources, was taken from the Audit Report of Wm. H. Mers and Company, Certified Public Accountants, for the year ended June 30, 1969.

OHIO RIVER VALLEY WATER SANITATION COMMISSION

STATEMENT OF REVENUES COLLECTED AND EXPENSES PAID
YEAR ENDED JUNE 30, 1969

Revenues collected:		
From signatory states, Schedule A		$192,790.00
From U. S. Department of Interior (Grant by authority of Federal Water Pollution Control Act)		167,077.00
Sale of publications		437.85
Interest earned on bank deposit		4,899.78
Miscellaneous income		4,275.00
Total revenues collected		369,479.63
Expenses paid:		
From state funds	$213,444.81	
From federal funds	157,621.63	
Total expenses paid		371,066.44
Excess of expenses paid over revenues collected		$ 1,586.81

STATEMENT OF RESOURCES JUNE 30, 1969

	State Funds	Federal Funds	Total
Available resources for period to June 30, 1968	$ 42,480.98	$ 29,157.43	$ 71,638.41
Add: Revenues collected:			
Annual budget — July 1, 1968 to June 30, 1969 (for detail see Schedule A)	182,000.00		182,000.00
U. S. Department of Interior		167,077.00	167,077.00
Sale of publications	437.85		437.85
Interest earned on bank deposit	4,899.78		4,899.78
Miscellaneous income	4,275.00		4,275.00
	234,093.61	196,234.43	430,328.04
Less: Expenses paid:			
July 1, 1968 to June 30, 1969	213,444.81	157,621.63	371,066.44
Available resources at June 30, 1969 before encumbrances	20,648.80	38,612.80	59,261.60
Encumbered resources at June 30, 1969	6,900.00	3,000.00	9,900.00
Available resources at June 30, 1969	$ 13,748.80	$ 35,612.80	$ 49,361.60

The above amount of $59,261.60 is comprised as follows:

Cash on deposit with The Central Trust Company		$ 56,318.55
Cash on deposit with American Airlines, Inc.		425.00
Cash on deposit with Ohio Bureau of Workmen's Compensation		120.00
Petty cash on hand		200.00
Accounts receivable:		
Advances for employees:		
Employees' pension trust	$ 1,901.55	
Hospitalization	296.50	2,198.05
Total		$ 59,261.60

SCHEDULE A—REVENUES COLLECTED FROM SIGNATORY STATES

	Balance Due June 30, 1968	Annual Budget	Revenues Collected	Balance Due June 30, 1969
State of Illinois	$ -----	$ 9,282.00	$ 9,282.00	$ -----
State of Indiana	-----	32,942.00	32,942.00	-----
Commonwealth of Kentucky	10,790.00	37,765.00	48,555.00	-----
State of New York	-----	2,002.00	2,002.00	-----
State of Ohio	-----	45,318.00	45,318.00	-----
Commonwealth of Pennsylvania	-----	27,664.00	27,664.00	-----
Commonwealth of Virginia	-----	6,370.00	6,370.00	-----
State of West Virginia	-----	20,657.00	20,657.00	-----
Total	$ 10,790.00	$182,000.00	$192,790.00	$ -----

ORSANCO DOCUMENTARY FILMS

Following is a list of ORSANCO films produced to illustrate various aspects of pollution abatement in the Ohio Valley. These 16 mm movies, in color and with sound, may be borrowed for group showings by addressing the state agencies listed on the inside back cover, or by request to Commission headquarters.

GOOD RIDDANCE This fast-moving, omnibus film depicts the progress made and the tasks that still remain in curbing water pollution in the Ohio Valley. This offers a general introduction on the regional crusade for clean streams undertaken by eight states. (29½ minutes)

BEARGRASS CREEK The story of what can happen to a stream when people along its banks disregard their obligation to prevent pollution. Of particular interest is the work being done by the University of Louisville in conducting the ORSANCO-sponsored study of aquatic-life resources. (19½ minutes)

OIL ON THE RIVER Beginning with the story of the discovery of oil in the Ohio Valley, this film shows the unhappy consequence of carelessness in handling, transportation, storage and use of oil products and then depicts preventive measures. (20½ minutes)

CRISIS ON THE KANAWHA A portrayal of industrial growth and the failure to keep pace with it in terms of river protection is the opening theme of this film. Then follows a detailed description of the remedial steps that are being taken to deal with the situation. (22 minutes)

RIVER WATCHERS Safeguarding streams from pollution hazards calls for constant vigilance. This is the story of the sentinels in the eight states who are engaged in checking sewage plant operations, aerial surveillance, virus identification, sampling of streams, forecasting river flow and evaluating the results from robot monitors. (18½ minutes)

THE FIRST FIFTEEN YEARS ORSANCO commissioners describe progress in the fifteen-year crusade for clean streams in the Ohio Valley. A highlight of the film is a visit to The Kettering Laboratory where toxicity studies are documented. (26 minutes)

COAL AND WATER A penetrating look at pollution problems created by the coal industry and the steps being taken to solve those problems. Included is a description of sealing operations in an underground mine to curb acid mine-drainage. (23 minutes)

"OOPS!" An educational film which demonstrates how careless actions within a plant may result in river pollution and steps to take to guard against such situations. Designed as an in-plant training aid to solicit employee and supervisor alertness in preventing accidental spills. (22 minutes)

REGULATORY AGENCIES OF THE SIGNATORY STATES

ILLINOIS

Technical Secretary
State Sanitary Water Board
535 West Jefferson Street
Springfield, Illinois 62706
Phone: 217-525-6580

INDIANA

Technical Secretary
Indiana Stream Pollution Control Board
1330 West Michigan Street
Indianapolis, Indiana 46206
Phone: 317-633-4420

KENTUCKY

Executive Director and Chief Engineer
Kentucky Water Pollution Control Commission
275 East Main Street
Frankfort, Kentucky 40601
Phone: 502-564-3410

NEW YORK

Deputy Commissioner
Environmental Health Services
New York State Department of Health
84 Holland Avenue
Albany, New York 12208
Phone: 518-474-2933

OHIO

Chief Engineer
Division of Engineering
Ohio Department of Health
P. O. Box 118
Columbus, Ohio 43216
Phone: 614-469-4470

PENNSYLVANIA

Sanitary Water Board
Box No. 90
Harrisburg, Pennsylvania 17120
Phone: 717-787-2666

VIRGINIA

Executive Secretary
State Water Control Board
P. O. Box 11143
Richmond, Virginia 23230
Phone: 703-770-2241

WEST VIRGINIA

Chief
Division of Water Resources
Department of Natural Resources
1201 Greenbrier Street
Charleston, West Virginia 25311
Phone: 304-348-2107