The Ohio River Valley Water Sanitation Commission And Its Activities

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Presented at the International Conference on
Environmental Pollution
Lisbon, Portugal, 15-19 April, 1991

INTRODUCTION

Sixty years ago, the Ohio River was frequently described as an "open sewer." In fact, it was reported in 1930 that because of a drought, the flow in the river was so low that some of the pools formed by the government navigational dams became virtually "open cesspools."

At the same time during this drought period, there was a succession of epidemics of gastroenteritis along the river and in the valley. The first outbreak occurred in Charleston, West Virginia, in 1930, where there were an estimated 4,000 to 7,000 cases among the city's 60,000 inhabitants. A number of cities along the river experienced similar outbreaks of gastroenteritis. These outbreaks were believed to have been caused by the contaminated condition of the river; fortunately, there were no reported deaths.

Only a few of the urban centers along the river were sewered at that time. Further, of the sewered population, less than 1 percent was served with any form of treatment facility. The pollutional load contributed by Cincinnati, Ohio (1930 pop., 450,000), was particularly distressing. To emphasize the point, someone creatively calculated that Cincinnati's daily pollutional load was equivalent to "720 dead horses" -- and that this amounted to the discharge of one dead horse every two minutes.

Interestingly, a number of states along the Ohio River had laws at that time which actually discouraged pollution control. For example, the State of Ohio had a law which said that no river community could provide sewage treatment until such time that all communities above it provided treatment.

Given this situation in the early 1930's, the public, including civic and business leaders, recognized that in order to improve public health and economic development, action was required to improve the water quality of the river. Further, it was clear that because the river embraced a number of separate states, a regional approach was needed.

In response to this interest, the U.S. Congress in 1936 authorized and, indeed, directed the states within the Ohio River Valley to negotiate an agreement or compact to abate pollution in the basin. The process of negotiating a compact between the different states involved turned out to be a most difficult task, principally because this was an untried mechanism for establishing regional cooperation for the control of water pollution. In view of this uncertainty, it was not until 12 years later that a compact between the several states was established.

This compact, authorized by the Federal Government through the U.S. Congress and ratified by the legislatures of eight states and signed by the Governor of each state, created the Ohio River Valley Water Sanitation Commission (ORSANCO) in 1948. The eight signatory states to the Compact include: Illinois, Indiana, Kentucky, New York, Ohio, Pennsylvania, Virginia, and West Virginia.

Among the specific charges given to ORSANCO in the Compact are to:

- Conduct surveys and studies of the basin to identify water pollution problems and develop programs for their control;
- Develop recommended legislation for adoption by the individual states to address pollution problems;
- Develop, as necessary, unified standards for the treatment of wastewaters discharged to the Ohio River and those tributaries which form boundaries between states or flow from one state to another.

In addition to these charges, the Compact, which has not been changed in its 43-year history, provides ORSANCO with the authority to enforce its adopted wastewater discharge standards utiliz-

ing the U.S. court system. Thus, ORSANCO is an interstate agency with regulatory and enforcement authority for improving and maintaining the water quality of the Ohio River.

The Compact provides that the Commission consist of 27 members -- three representatives or Commissioners from each signatory state and three Commissioners representing the Federal Government. The Federal representatives are appointed by the President. The state representatives are either appointed by their respective Governor or serve as ex-officio members by virtue of their position as head of the state's environmental protection or water pollution control program.

Integral to the Commission's operation is its committee structure. This includes standing committees consisting of Commissioners, advisory committees made up of representatives of specific outside interests, and special committees.

The Commission convenes three times a year in order to conduct business and establish policies and programs to carry out the objectives of the Compact. The Commission is headquartered in Cincinnati where a full-time staff of 17 is responsible for carrying out the established policies and programs.

The Commission's operating budget is supported proportionately by the eight member states, taking into account population and land area in the drainage basin. For 1990, the total budget was approximately $1.2 million, of which $780,000, or 65 percent, was provided by the states; the remainder came from the Federal Government through the U.S. Environmental Protection Agency.

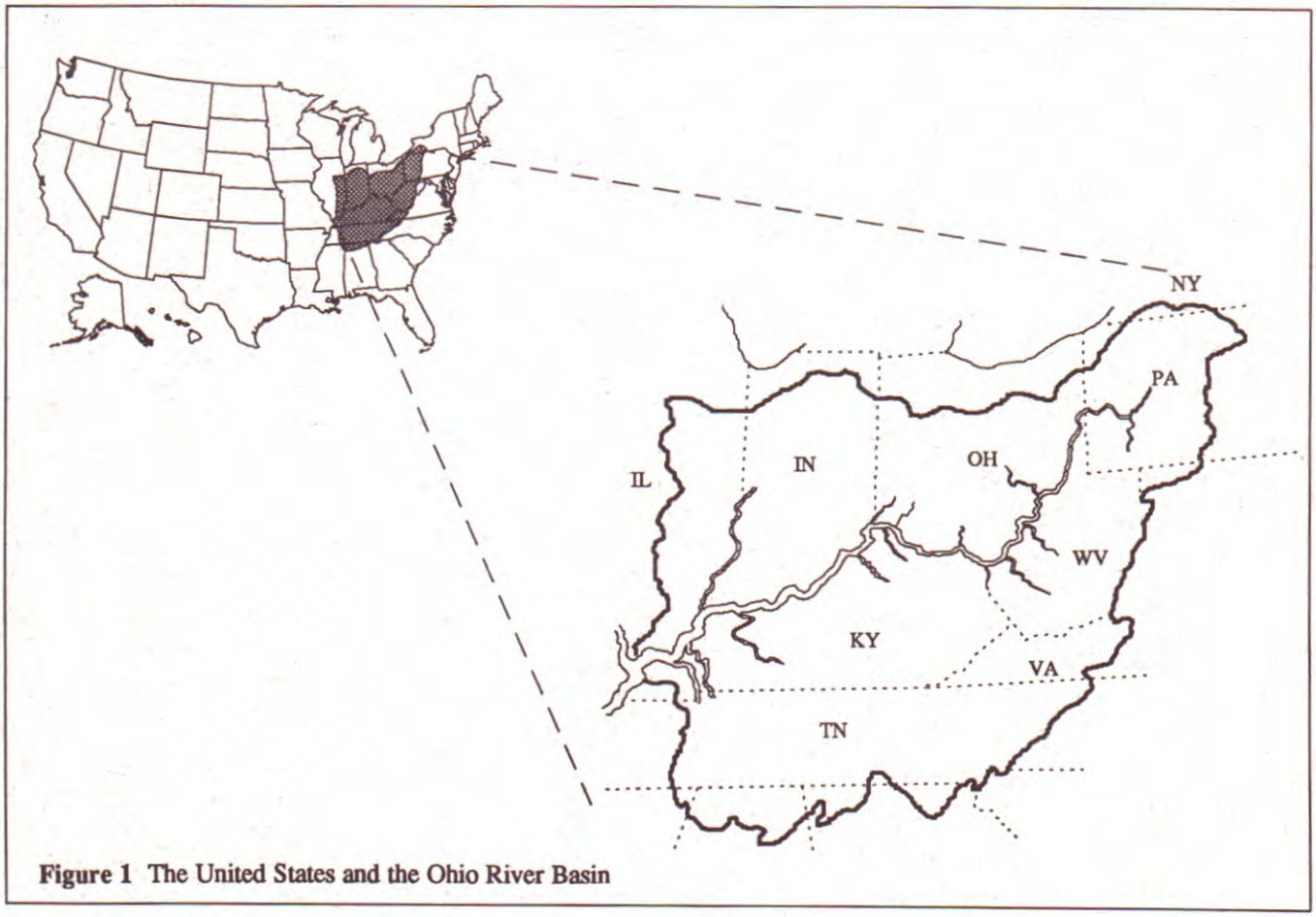

Figure 1 The United States and the Ohio River Basin

DESCRIPTION OF THE OHIO RIVER

The Ohio River is formed at Pittsburgh, Pennsylvania, at the confluence of the Allegheny and Monongahela Rivers, and flows 981 miles in a generally southwest direction to join the Mississippi River near Cairo, Illinois. The first 40 miles of the river are within Pennsylvania; the remaining 941 miles form the state boundary between Ohio, Indiana, and Illinois to the north and West Virginia and Kentucky to the south of the river. The drainage basin totals 203,000 square miles, or about 5 percent of the contiguous U.S. (Figure 1).

The flow in the river is regulated by a series of locks and dams operated and maintained by the U. S. Army Corps of Engineers. The 20 dams on the river create a series of pools, so that depending on location, the flow in the river averages 35,000 to 250,000 cubic feet per second (CFS).

Today, approximately 21 million people (or almost 10 percent of the U.S. population) reside in the basin within the eight member states of ORSANCO. The river is a water supply source for nearly 3 million people.

Of the total 194 municipal wastewater treatment facilities discharging directly to the Ohio River, 126 have flows of 40,000 gallons per day or greater; these 126 facilities serve 3.5 million people. The major discharges of treated municipal wastewater are at Pittsburgh, Cincinnati, and Louisville.

There are also a variety of industrial discharges to the river, including steel, chemical, and power production. Of the total 383 industrial discharges, 114 are contaminated process discharges with flows of 40,000 gallons per day or greater.

Regarding power production, there are 44 generating facilities on the river which constitute approximately 6 percent of the Nation's installed generating capacity.

The river is also a major artery for the transportation of industrial materials. In 1986, almost 200 million tons of cargo were transported through barge traffic, including 25 million tons of petroleum and hazardous chemicals.

In addition, because of improved water quality, the river is being used more and more for such recreational activities as boating, water skiing, and fishing.

PROGRAMS OF ORSANCO

The current activities of ORSANCO may be classified into five general categories. All five areas involve a strong interrelationship between local, state, and Federal governments, public utilities, industries, and the general public.

Water Quality Monitoring

Valid data on water quality conditions of the river are essential to the efforts of the Commission and its member states in carrying out the provisions of the Compact. In order to obtain such data in a cost-effective and consistent manner, the Commission has the responsibility for monitoring the river and the lower reaches of its tributaries.

Through the Commission's committee structure, representatives of the states and other interest groups have input in determining the scope of the Commission's monitoring programs.

Certain monitoring programs involve sample collection by ORSANCO personnel with analyses being performed by contract laboratories, while other programs involve the compilation of water quality data generated by other agencies and organizations.

The four monitoring programs are:

Manual Collection of Samples. This program consists of 36 fixed stations, of which 22 are located on the main stem of the river and 14 on the lower reaches of the major tributaries. Samples are collected by ORSANCO personnel and analyzed monthly for 32 constituents/properties, including the conventional pollutants, heavy metals, cyanide, and phenolics.

Organics Detection System. This program, established in 1978, involves daily sampling at 15 water utilities and industries along the river and certain major tributaries. Each sample is analyzed for 22 volatile organic compounds using gas chromatography. The results of this monitoring program are integral to the Commission's toxic substances control and spill response programs.

Water Users Network. Municipal and industrial facilities that use the river or its tributaries as a source of water supply perform analyses on untreated water as part of their operation. These facilities provide data, usually daily or weekly, on a variety of constituents/properties, including alkalinity, chlorides, pH, fecal coliform, temperature, turbidity, and dissolved solids.

Fish Population and Tissue Analysis. The Commission has coordinated multi-agency studies on the fish population of the river at regular intervals since 1968. Currently this is a yearly activity with various state environmental and wildlife agencies, the U.S. Army Corp of Engineers, the U.S. Fish and Wildlife Service, and the U.S. Environmental Protection Agency participating. Analysis of fish tissue for selected pesticides and other contaminants known to biomagnify/bioconcentrate has been included in the fish population studies since 1975.

In addition to being a source of water quality data for the various state and Federal agencies, these monitoring programs provide the data base which is the source of information, or the "backbone," for a number of different but related programs of the Commission.

Wastewater Discharge Standard Setting and Enforcement

The Commission maintains wastewater discharge standards for the Ohio River. The formulation of these standards involves joint discussion among representatives of the states and other interests within the framework of the Commission's committee structure. After public hearings and adoption, it is the responsibility of the individual state agencies, in consonance with their commitment to the Compact, to oversee the application of the standards within their state.

Because the states have been effective in applying the Commission's adopted standards, ORSANCO's enforcement powers have been utilized infrequently. The Commission prefers to work through or with its member states or the Federal Government when it comes to enforcement.

For example, it became evident in 1985 that the major point source of pollution to the river was the 130 million gallons per day (mgd) discharge of a particular wastewater treatment plant. Because of a number of problems, this secondary treatment plant was not performing adequately so as to meet its effluent discharge limitations or ORSANCO's standards.

As a result, the Commission joined with the regulatory agency of the appropriate state and the U.S. Environmental Protection Agency in a court order which required that the treatment plant achieve compliance with established effluent limitations by July 1988. After spending over $110 million on a construction program to improve its secondary treatment, sludge handling and disposal, and disinfection facilities, the plant achieved compliance on schedule.

Water Quality Assessment

The Commission staff reviews all the ambient water quality monitoring data for validity and evaluates the data for any exceedances of the established water quality criteria. If a water quality problem is evident, a study is implemented to determine the cause(s) of the impairment so that a remedial program can be established. Attention is given to the impact of both point and non-point sources as well as to tributaries. These assessments permit an evaluation of progress, of the relative magnitude of the causes of water quality impairment remaining, and of the effectiveness of the current control efforts.

Toxic Substances Control

The control of toxic substances which affect Ohio River water quality has long been a concern of the Commission. In 1983, a Toxic Control Strategy was adopted, following input from representatives of state and Federal Governmental agencies, industry, water utilities, and the public. The program/strategy is based upon a three-step approach toward the control of toxic substances:

- Compile and assess all Commission ambient water quality data on toxic substances to identify problem areas in the river.
- For each problem area, perform the necessary detailed water quality analyses to identify the causes/sources of the toxic substance(s) in question.
- Develop control strategies for the identified causes/sources of toxic substances.

Spill Response

The reporting of spills and accidental discharges to the Ohio River and its tributaries also has long been a major concern of the Commission. Any spill to the Ohio River or its tributaries has potential interstate impact and can disrupt water supplies.

The Commission serves as the central point of communication when spills occur to assure that affected states and downstream water utilities are promptly notified. This is accomplished through a network communication system, including an Electronic Bulletin Board for the rapid dissemination of information.

In addition to coordinating communication, the Commission staff provides estimates of in-stream concentrations and time-of-travel of the spilled material and, if deemed necessary, initiates an emergency in-stream monitoring program.

To cite one particular incident, a major spill occurred on January 2, 1988 on the Monongahela River, 20 miles upstream of Pittsburgh. At the time, this spill was of unprecedented magnitude and character insofar as the inland waters of the U.S. are concerned.

In this spill, a 3.8 million gallon storage tank collapsed, releasing approximately 700,000 gallons of diesel fuel to the river. Attempts to contain the oil using surface booms were only partially successful. The Commission was notified and the staff immediately responded by coordinating efforts to track the oil spill's movement down the river and providing information to state and Federal agencies, water supply utilities, and the public.

For tracking the movement of the oil spill down river, it was determined that fluorometric measurement would give the most rapid results. Analyses were performed to determine the daily location of the frontal edge, peak, and trailing edge of the spill (Figure 2).

Water samples were also analyzed by gas chromatography under the Commission's Organics Detection System. Through these measurements it was possible to follow the movement of the fuel oil downstream. This information permitted the water supply utilities, withdrawing water from the river, to know the time of arrival

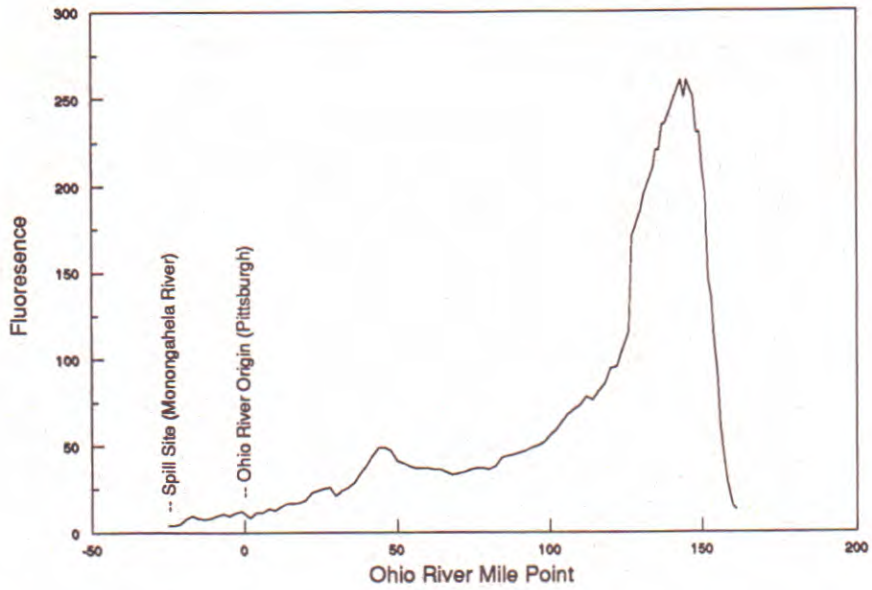

Figure 2 Profile of Diesel Fuel in the Ohio River (January 16, 1988, 14 days following spill)

and passage of the spill so that appropriate protective measures might be taken.

The water supply utilities handled the problem in a variety of ways. By knowing the time-of-travel from the monitoring data, some utilities simply closed their intakes on the river during passage of the spill. Other utilities turned to alternative sources of raw water during the period that their system would be impacted. In several cases, barges were filled with water from tributaries which were not affected by the spill. Some utilities simply adjusted their treatment by increasing their coagulant dosage and/or by adding activated carbon during that period when the oil spill was passing their intake on the river.

Besides the problems associated with water supplies, the oil spill had a severe impact on the aquatic life in the river. It was estimated that over 10,000 fish were killed downstream of the site of the spill.

WATER QUALITY IMPROVEMENTS

Although precise information is lacking, considerable progress was made during the early years of ORSANCO to control pollution along the Ohio River stemming from municipal wastewater discharges; first the construction of primary treatment plants, then secondary plants. Compiled statistics show that there also has been significant progress since 1970, when the Commission promulgated standards requiring secondary treatment of all municipal wastewaters and equivalent treatment for industrial discharges. Table 1 shows the percent of the sewered population along the Ohio River served by secondary treatment between 1972 and 1990.

As a result of enhanced municipal and industrial wastewater treatment, the quality of water in the Ohio River has improved over the years. This is evident from the dissolved oxygen (DO) levels, which have increased at most locations along the river. In comparing the DO levels at various locations during the similar low flow conditions caused by the droughts of 1965 and 1988, it was found that the DO concentration in the river

was, with few exceptions, significantly higher in 1988 than in 1965.

Correlating with the improvements in DO levels, fish population studies indicate a balanced population today throughout the Ohio River, including many pollution sensitive species. There has been a 40 percent increase in the diversity of the fish population over the past 13 years.

For example, the sauger (a desirable pan fish) returned to the lower reaches of the river beginning in 1968. Today it is well established throughout most of the river. Because of improved water quality and the associated improvement in the biological community, sport fishing today is a very popular activity along the river. It is also is used extensively for boating and water skiing.

ORSANCO recently completed a trend analysis of a number of chemical constituents important in assessing water quality improvements in the river. For example, there has been a gradual decrease in the concentration of ammonia in the river since 1977 (Figure 3). Similar decreasing trends were documented for six other constituents commonly associated with wastewater discharges, namely, lead, phenolics, total phosphorus, total kjeldahl nitrogen, copper, and zinc.

CONCLUSIONS

Over ORSANCO's 42 year history, the water quality of the Ohio River has improved significantly. The Commission's effectiveness may be specifically attributed to the following:

- The Commission is vested with statutory authority to establish unified standards for the treatment of wastewaters and to enforce the standards.

- The individual Commissioners of ORSANCO are appointed by the highest governmental authorities, i.e., the Governors of the various states and the President of the United States.

- ORSANCO acts as the agency through which the states can negotiate and agree on programs for pollution control. For those programs carried out by the states, the Commission facilitates coordination and information exchange. The Commission implements certain other programs itself, e.g., water quality monitoring, thereby eliminating or minimizing problems of duplication of effort, inconsistencies in data collection, interpretation, and assessment.

Table 1

Municipal Wastewater Treatment Plant Discharges to the Ohio River:
Sewered Population vs. Secondary Treatment

Year	Total Sewered Population	Sewered Population with Secondary Treatment	Percent Population with Secondary Treatment
1972	3,575,000	71,000	2.0
1982	3,587,000	2,995,000	85.3
1990	3,597,000	3,565,000	99.1

- The Commission effectively integrates input of various interests affected by its programs, including industries, utilities, and the public, through its sponsorship of advisory committees. As a result, the Commission enjoys widespread support.

- Because of the broad authority of the Compact, the organizational nature of the Commission, and its separate but adjunct relationship to the various state water quality control agencies, ORSANCO can react swiftly to meet changing conditions and challenges affecting water pollution control.

ORSANCO is a model to be considered elsewhere for effective water quality management. In the case of a river basin transcending states, provinces, regions, or nations, a Commission such as ORSANCO, representing multiple jurisdictions, can be an effective mechanism for achieving the coordination and communication essential to abating water pollution.

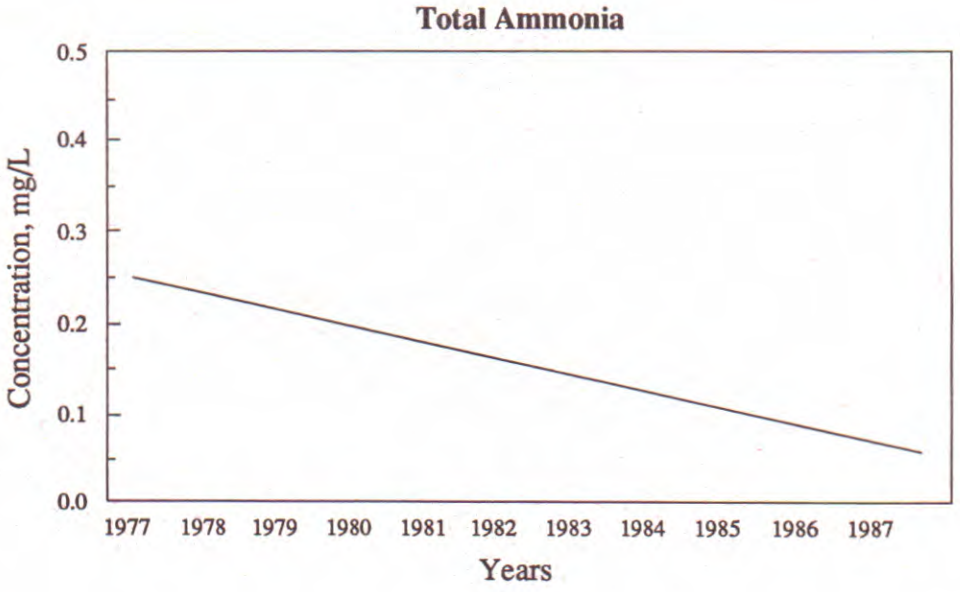

Figure 3 Trend of Total Ammonia Concentration in the Ohio River at Galipolis, Ohio (mile point 279.2)

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