

Resource Development and Conservation History Along the Ohio River¹

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ABSTRACT. The 1578 km-long Ohio River has a rich history of natural resource use and abuse, starting with the development of the river itself for navigational purposes. There is a rich early record of natural history studies by Bartram, Michaux, Lesueur, Rafinesque and others. The navigational use of the river began with snag pulling and has progressed to modern high-lift dams. Flood control, navigation of tributaries, and canal-building have been water resource development projects of the past. Early industries that developed around the availability and abundance of coal, oil, natural gas, salt, iron ore, timber, and clay in the valley ultimately led to the more recent pottery, iron and steel, chemical, and power generation industries along the river and its tributaries. There were also major horticultural developments of apple orchards, wine vineyards, and even silk worm farms along the river and a modest button industry from the mussels in the river itself. The pollution of the Ohio River has been a concern for decades, and the involvement of the federal government and the establishment of interstate compacts have led to the development of significant understanding of the science of water pollution and to the general improvement of the river's water quality.

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INTRODUCTION

Thomas Jefferson called the Ohio River "the most beautiful river in the world" (Jefferson 1801). Sometimes called the "Gateway to the West" (King 1967), the Ohio's long 1578 kilometer (981 mile) reach of water has been the highway for explorers, settlers, and commerce. Draining an area of about 530,000 square kilometers (204,000 square miles or 7% of the United States), its watershed includes parts of 14 states, stretching from New York State to the Mississippi River.

The Ohio River has been a river of many events in making the history of this country. Perhaps less evident have been those associated with the river itself and its natural resources. From the days of Colonel George Washington over 200 years ago, there have been continual efforts to make the Ohio River navigable, overcome floods, droughts, pollution, and tie its resources and people to one of America's great water arteries. The river has also spawned many firsts in conservation-related work. The Ohio Valley has yielded and transported many resources such as coal, timber, iron ore, salt, clay, and oil. It has seen wine vineyards and steel mills, apple orchards and power plants, silk worm farms and chemical plants. Its deep, busy and still beautiful waters of today are the mark of this effort. This paper reviews some of the history of natural resource development and use along the Ohio River. Locations of some of these events, are illustrated (Fig. 1).

EARLY NATURAL HISTORY SURVEYS

John Bartram, one of the first natural scientists to visit the Ohio River area at Pittsburgh, published a book in London in 1751 describing climate, soil, rivers, and animals of the region (Bartram 1751). He has been called "The Father of American Botany" and the Indians called him "Puc Puggy," the flower hunter (Freeman and Frome 1968). He had been invited to join the Lewis and Clark expedition as botanist, but did not accept because of his old age. In 1766, Lt. Thomas

Hutchins made a survey of the river and the first accurate report and map were published from this survey in London in 1778 (Banta 1949). It was in East Liverpool, Ohio, along the Ohio River, that Hutchins, in 1785, began his survey of the "Seven Ranges" (Johnson 1978). The starting point was about where Little Beaver Creek joins the Ohio River. This became the start of the American rectangular survey system which was later used in much of the West (Fig. 2). Steubenville, Ohio, also along the river, has the distinction of being the home of the first office to handle federal land transactions for the newly-formed Northwest Territory. The building is preserved as a museum of maps and related memorabilia of the early 1800s.

As early as 1770, George Washington explored the Ohio Valley and made claims of many of the lands for himself and his family. In 1787, a few years after George Washington's surveys, General Rufus Putnam and others stepped ashore at the mouth of the Muskingum River from their flatboat "Adventure Galley" to establish the first official settlement, now Marietta, Ohio, in the newly formed Northwest Territory. General Putnam was the second chief of the Army of Engineers Corps and Surveyor-General of the United States. He later built Campus Martius at Marietta and became a trustee of Ohio University. Historians have titled him "Father of Ohio" (Johnson 1978).

Zadok Cramer published "The Navigator" in Pittsburgh in 1801. It was a pocket-sized "almanac" of the Ohio River describing navigation, towns, and riversides, and included maps. New issues were published over a period of some twenty years. It was widely advertised and used, and its 1824 edition contained a description of the start of the Lewis and Clark expedition down the Ohio River (Havighurst 1970).

Francois André Michaux, son of the famous botanist André Michaux, came to the Ohio River in 1802 as an agent of the Republic of France and published a book in Paris in 1804 which described the flora of the river banks (Michaux 1804). He wrote: "In more than a thousand places of the territory I have passed over at different periods in North America I do not recollect to have seen one which can be compared to the vegetative power of its forests . . . thirty-six miles before reaching

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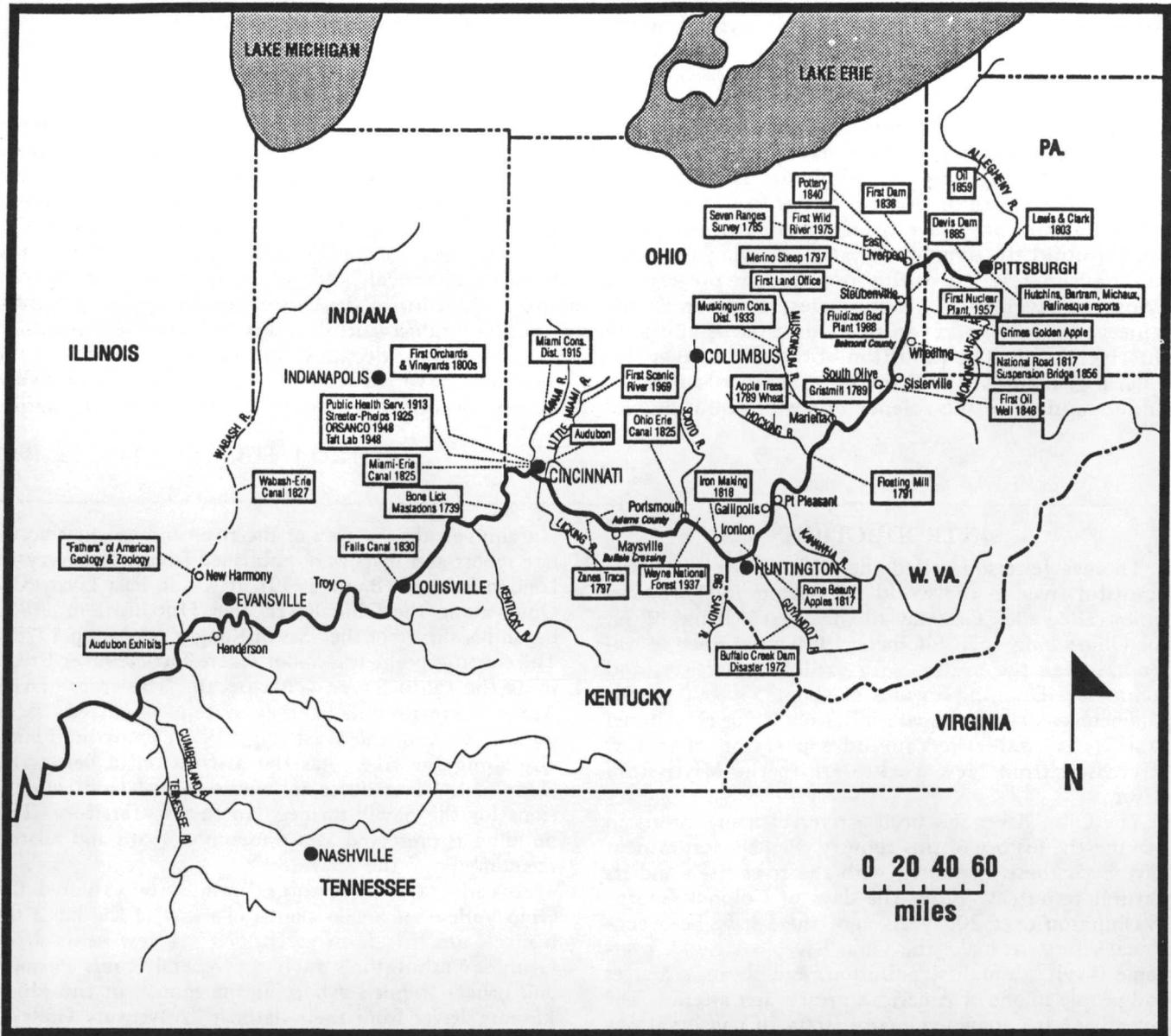


FIGURE 1. Map of the Ohio River Basin showing places and events described in the text.

Marietta . . . a plane tree measured forty-seven feet in circumference. . . . The soil is a true vegetable earth, produced by the thick bed of leaves . . . and from the trunks of the enormous trees destroyed by age . . . which decay very rapidly” (Michaux 1804). In 1810-1813 he published the classic work, “The North American Sylva” (Michaux 1813) based on the explorations and collections of his father and himself (Banta 1949).

New Harmony, Indiana, a short way up the Wabash River from the Ohio River, was the utopian village of Robert Owen, which became the home at one time for many of the most distinguished natural historians in young America. Founded in 1825, New Harmony was the working home of William Maclure, the “Father of American Geology,” Thomas Say, often called the “Father of American Zoology” (Madison 1986) and the “Father of American Descriptive Entomology”, and Charles Lesueur, a noted French paleontologist, ichthyologist, zoologist, and artist. All of these scientists were involved in the 1825-26 Boatload of Knowledge trip down the Ohio River from Pittsburgh, so named

because of Owen’s description of the trip as “. . . more learning than ever was before contained in a boat” (Pitzer 1989).

In the early 1820s, John James Audubon came down the Ohio River with a group of explorers to look for new birds to draw and describe (Rankin 1981). Audubon was a taxidermist at the Western Museum in Cincinnati, and it was while living in Cincinnati that he got his idea for a book called “the elephant folios,” which were later printed as his life-size publications of waterfowl. Audubon later became the famous wildlife artist and is commemorated by a state park named after him in the Ohio River town of Henderson, Kentucky.

In Adams County, Ohio, John Locke, assistant geologist of the Ohio Geological Survey, made the first county geological map in Ohio about 1838. It may have also been the first in the nation.

NAVIGATION

Herbert Hoover opened the Ohio River to modern navigation in 1929. The event was marked by a monu-

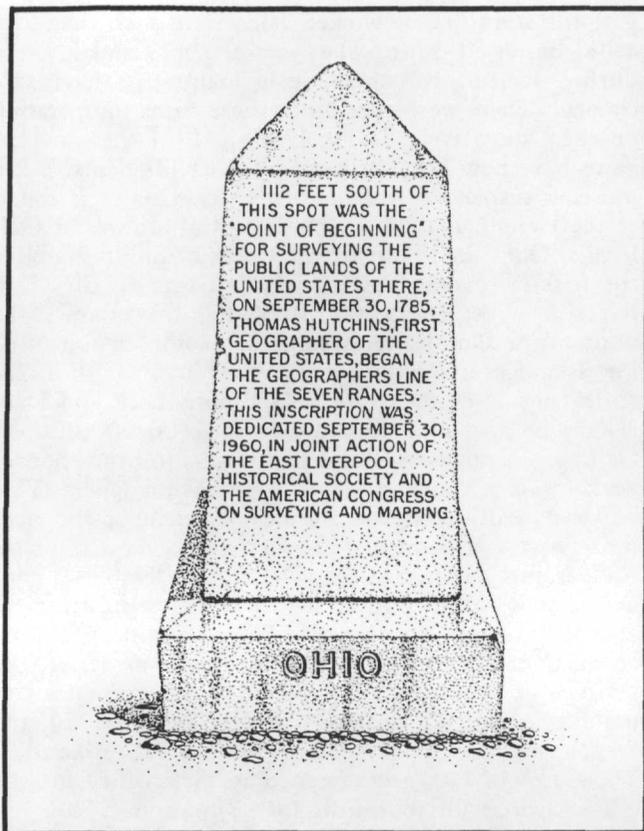


FIGURE 2. This is a drawing of the monument near East Liverpool, Ohio, that marks the beginning of the survey of the public lands by Lt. Thomas Hutchins in 1785, called "The Seven Ranges" survey. Courtesy U.S. Department of the Interior, Bureau of Land Management.

ment at Eden Park, Cincinnati, and further commemorated with the first U.S. postage stamp depicting Ohio River navigation (Fig. 3). It is a busy river in the present day, with traffic of large tow boats transporting 150 million tons of cargo yearly through long pools of



FIGURE 3. This stamp was issued October 19, 1929, to commemorate the completion of canalization of the Ohio River. Over 32 million were purchased. They were carmine rose colored. Courtesy of Smithsonian Institution.

deep water made possible by 20 dams. But it was not always that way.

As early as 1787, George Washington had been a strong proponent of improving the Ohio River and other waterways and building canals as a means to tie the country together. Some believe that this interest helped spawn the Constitution (Johnson 1978). The idea was expressed further in the Northwest Ordinance of 1787 in Article IV which stated that "the navigable waters . . . shall be common highways and forever free" for travel and use by all states without tax or charges (Frost and Nichols 1986). With few roads, rivers were the highways for early travel in canoe, keelboat and flatboat in the 1700s (Fig. 4). The chief impediments to this travel were low water, sand bars, and snags. To get keelboats back up the Ohio River, boatmen would often grasp willow tree branches close to the bank and pull the boats upstream, a process called "bushwacking". In 1803, the Lewis and Clark expedition, which had started from Pittsburgh, struggled 76 days because of low water to get their keelboats to the mouth of the Ohio River (Johnson 1978).

Things were a little better in 1811 when the "New Orleans", built at Pittsburgh by Nicholas J. Roosevelt, became the first steamboat to travel down the Ohio River and ultimately to New Orleans via the lower Mississippi River. It passed through the region of the great New Madrid Earthquake while the earthquake was occurring, causing much concern and excitement for the passengers (Dohan 1981). The Pittsburgh region, along with Cincinnati and Louisville, became a center for building many river steamers over the next seventy years, with almost 700 having been built by 1835. The captain of one ship from Pittsburgh sailed to Italy, where it took some explaining to convince authorities that such an inland port existed up 3200 km (2,000 miles) of river systems (Banta 1949).

Interest in improving the Ohio River for navigation got a boost when the Ohio General Assembly invited the states along the Ohio River to form a commission to encourage river improvements. In 1819, a joint committee of the Ohio Valley states gathered at Pittsburgh to make plans. The commission mapped 102 obstructions between Pittsburgh and Louisville. Congress

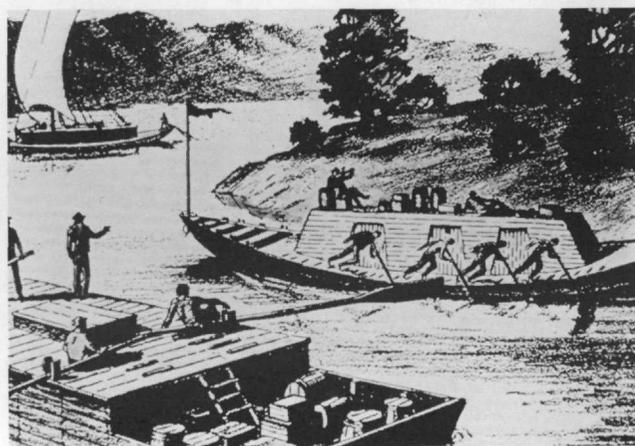


FIGURE 4. Early transportation on the Ohio River was by keelboats and flatboats, the keelboats to go upstream and the flatboats downstream. By the 1840s, there were 4,000 flatboats on the Ohio. Courtesy U.S. Army Corps of Engineers.

helped in 1820 by appropriating \$5,000 for the survey. This marked the start of federal water resources programs in this country. By 1821, the Pennsylvania government had appropriated \$15,000 for this work, but when the other states did not match it, improvements were limited to the upper Ohio River. In 1824 Congress passed the General Survey Act, which gave the U.S. Corps of Engineers continuing authority for navigational studies (Frost 1976, Johnson 1978).

In 1827, Congress passed the first Rivers and Harbors Act to authorize federal removal of river obstructions and improve harbors. The Army offered a \$1,000 prize for the best snag removing device on the Ohio River. Some of the snags were over 30 meters (100 feet) long. Snag-lifting boats were designed and popularly called "Uncle Sam's Toothpullers" (Fig. 5). By 1870, Colonel William E. Merrill was in charge of this work, and he is recorded in history as the "Father of Ohio River Improvements" (Johnson 1978).

Besides snag-pulling, dredging sand bars was also a popular means of navigational improvement. In 1878, the first dredging to a 2-meter (6-foot) depth started, and in 1905 Congress authorized the depth to 3 meters (9 feet). To complete the navigational improvement, locks were needed. The first navigational lock was built in 1885 at Davis Island, five miles below Pittsburgh. It backed up the Ohio River and gave Pittsburgh a harbor large enough for 12,000 boats and barges. Several years earlier in 1838, the first federal dam on the Ohio River was built at Brown's Island 11 km (7 mi) above Steubenville to divert the river around one side of the island (Johnson 1978). From 1910 to 1929, the U.S. Army Corps of Engineers built a series of movable Chanoine wicket dams on the river to maintain the 3-meter navi-

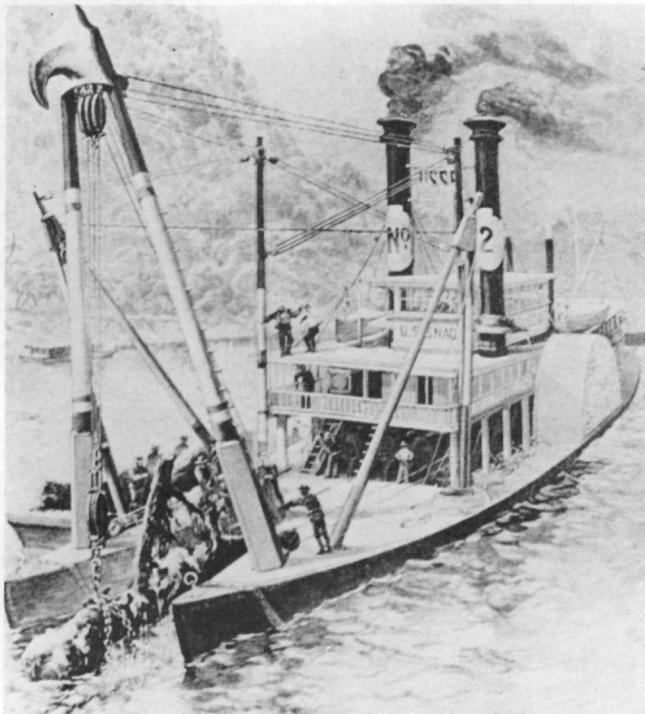


FIGURE 5. Getting snags out of the Ohio River was a constant effort in the 1800s. This government snag boat was one of five used after 1852. In 1888, over 1,200 snags were removed, one weighing 164 tons. From Harper's Weekly, 2 November 1889, courtesy U.S. Army Corps of Engineers.

gation system. These wicket dams were such that they could be raised during slack water times and lowered during flooding to continuously maintain a navigable channel. There were once 54 of these dams in operation on the Ohio River (Taylor 1989). All of these wicket dams have now been replaced by high-lift dams, but a museum displaying one of these wicket dams is found at the Hannibal, Ohio, Lock and Dam. It was at Gallipolis, Ohio, in 1938 that the Corps of Engineers built the first of several high-lift roller dams on the Ohio River at a cost of \$10,000,000. The final dam to be built in the Ohio River system was completed at Willow Island near Parkersburg, West Virginia, in 1976. An expansion of the original Gallipolis Lock and Dam is now being planned, at a cost of \$300,000,000, as Gallipolis is now considered the most significant bottleneck to river transportation in the Ohio River. This will eventually complete the development of the river into a series of 4-meter (12-foot) pools. As a result of navigational damming, the river now resembles a connected series of lakes more than a free-flowing river.

It is of interest to note that French engineers carried on many of the first civil works on the Ohio River, the heritage of which the Corps of Engineers recognizes in its official seal - "Essayons" (Let Us Try). In 1754, the French built Ft. Duquesne at what is now Pittsburgh. The Corps of Engineers opened its first office for the Ohio River at Pittsburgh in 1866 (Johnson 1978).

Geology came into the navigational picture at Louisville, where rock ledges of Devonian limestone created the "Falls of the Ohio" and long were an impediment to travel down the Ohio River. In December 1830, the Louisville and Portland Canal Company opened a canal to bypass these falls on the Ohio River, the first privately-built canal on the River. Congress had assisted by authorizing purchase of stock representing about one-third of the cost to build the locks and dams. The dividends from locking charges more than repaid both the government and private investors (Yater 1979). On June 10, 1874, by act of Congress, the federal government took over the Louisville and Portland Canal and in 1880 all tolls were canceled. This was in accordance with the Treaty of Paris in 1783, the Treaty with Spain in 1795, and the Northwest Ordinance of 1787 (Johnson 1974).

CANALS AND TRIBUTARIES

Several major tributaries and later artificial canals also became important conduits for the transportation of produce, natural resources, and people in the early days of Ohio River use. Furthermore, in the early 1800s, both Ohio and New York passed laws creating agencies to build a system of internal canals. In Ohio, this led to construction of waterways connecting to the Ohio River. Feeder lakes for those waterways became Ohio's first state parks and are still in use today for recreation (Frost 1976).

MUSKINGUM RIVER. On January 9, 1824 a steamboat, the "Rufus Putnam", made the first steamboat trip up the Muskingum River, which drains one-fifth of Ohio (Johnson 1977). It started a new commerce on the river, and in 1832 the State of Ohio started to canalize it. The U.S. Army Corps of Engineers later took over the system and returned it to state control in 1960.

Today Ohio maintains the old locks and dams for recreational boating. The Muskingum Watershed Conservancy District established Ohio's world renowned first multiple-purpose water management and land conservation river basin project in 1933.

OHIO-ERIE CANAL. Portsmouth, Ohio, located at the confluence of the Scioto and Ohio Rivers, was at the southern end of the Ohio-Erie Canal. The canal, started in 1825, had long been a dream that became a reality when it linked the Ohio River with Lake Erie. This canal gave Ohio its first reservoirs and state parks, boosted agriculture, and left Ohio with many historic memories (Frost 1983).

MIAMI-ERIE CANAL. Cincinnati, now the home of the Ohio River Division of the U.S. Army Corps of Engineers (first office opened in 1901), was once the terminus of the Miami-Erie Canal, started in 1825. In 1842, the Corps opened an office of Western River Improvements (Johnson 1978).

LITTLE MIAMI RIVER. Some tributary rivers of the Ohio have escaped the distinction of being "improved" and are now considered important conservation areas. For example, the Little Miami River, which empties into the Ohio at the eastern outskirts of Cincinnati, was designated as Ohio's first scenic river on April 23, 1969. In 1968, Ohio passed the first law in the nation to preserve scenic rivers. In 1973, the Little Miami was also entered into the National Scenic River system. In 1980, its lower portion was made a component of the

National Recreation River System. Dave Roberts of Cincinnati and Glen Thompson of Dayton were early leaders in the 1950s to preserve the Little Miami (ODNR 1984, Laycock and Laycock 1983).

WABASH RIVER. The Wabash River, where it enters the Ohio in southern Indiana, has a watershed covering almost two-thirds of Indiana. The Wabash and Erie canal was started in 1827 to connect the Ohio River with Lake Erie, aided by a grant of 202,350 hectares (500,000 acres) of land from the federal government. Finally completed in 1853, its 753 km (468 mile) length made it the longest canal in the country (Madison 1986).

ROADS TO THE OHIO RIVER

Several towns along the Ohio River emerged because of their role as the terminus of land routes to the Ohio River. The terminus of the famous National Road (also known as the Cumberland Road) at Wheeling, Virginia in 1817 stimulated Wheeling's growth as a large shipping center on the Ohio River (Fig. 6). Following the path of the buffalo and General Braddock's army, the road had come from Cumberland, Maryland, to Virginia (now West Virginia), and by 1840 was called the National Road. Also referred to as the Old Pike, it was the longest wagon road and the first improved federal road in the country. Congress considered it important in the 1800s to have a road from the Potomac River at Cumberland to the Ohio River at Wheeling Creek as

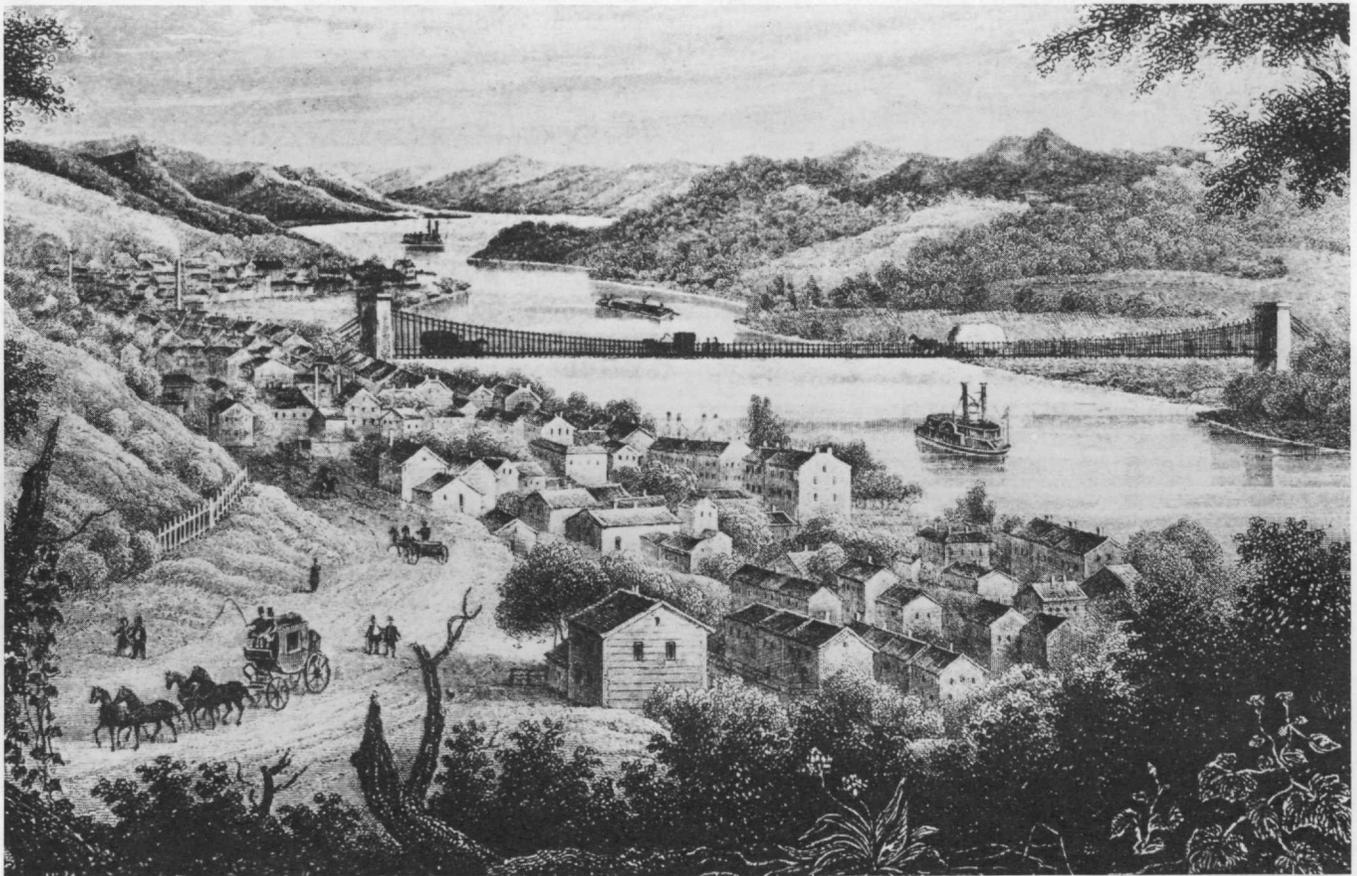


FIGURE 6. Sketch of Wheeling, Virginia, and the Ohio River made from Wheeling Hill about 1850. The old National Road with the stagecoach is the foreground while the Wheeling Suspension Bridge is shown crossing the river. Courtesy Oglebay Mansion Museum, Wheeling.

“the most advantageous route to the new Northwest Territory” (Morse and Green 1971). An historic bridge in Wheeling is the Wheeling Suspension Bridge built from Wheeling to Wheeling Island (in the Ohio River). The bridge was completed in 1849 after two years of controversy and was designed by Charles Ellet, Jr. The bridge was completed in the twilight years of the Old Pike, as the Baltimore and Ohio Railway reached Wheeling in 1852. It was blown down during a storm in 1854 and the new 1,010 foot span was completed in 1856. It was then the longest suspension bridge in the world. That bridge is still in use today.

Maysville, Kentucky (once called Limestone) is another town that, in part, owes its existence to its role as the terminus of a land route to the Ohio River. The town derives part of its historical recognition for being the site of a famous buffalo crossing of the Ohio River and the animal pathway was called the Buffalo Trace (Laycock and Laycock 1983). It also was the point to which early flatboat navigators returned by foot from New Orleans up Natchez Trace to Nashville, thence to Limestone (Brant 1978). Across the Ohio River they followed the trail of the buffalo, part of which was to become known, in 1797, as Zane’s Trace.

FLOODS AND FLOOD CONTROL

Floods and recovering from floods have been an important and expected part of the history of the communities along the Ohio River. One of the earliest recorded floods of the Ohio River wiped out an Indian village in 1765 at what is now Portsmouth, Ohio. Portsmouth now has a flood wall for protection. Wellsburg, Virginia (now West Virginia) was possibly the first community on the Ohio River to have built a flood wall, which was constructed in 1829. The Ohio River flood of 1937 set a record at Cincinnati, reaching a height of 8 meters (27 feet) above flood stage and cascading 1.5 million tons of water by and through the city every minute. There was much damage. This flood led to the building of the first barrier dam on the Ohio River at the mouth of Mill Creek. It was designed to keep Ohio River flood waters from backing up into Mill Creek. A battery of huge pumps empty the flood waters from Mill Creek into the Ohio when the gates are closed (Cauffield and Banfield 1981). At the extreme southwest corner of Ohio the Miami River enters the Ohio River. A record-setting flood in 1913 killed hundreds which led to the passage of the Conservancy District Law. By 1919, the Miami Conservancy District had started construction of the first major river basin flood prevention system in the nation, financed with local funds.

GEOLOGIC RESOURCES

OIL AND NATURAL GAS. The wealth of minerals and the boom and bust of economies based on finite resources have given the Ohio River Valley and its tributary valleys a rich history. The discovery of oil is prominent in that history. In 1814, the first oil well in Ohio was drilled near South Olive in Noble County, Ohio about 24 km (15 miles) north of Marietta. Two men were searching for brine, but at a depth of 145 meters (475 feet) they found oil instead of salt water (Fig. 7). Because the Ohio oil well was not developed, it was not

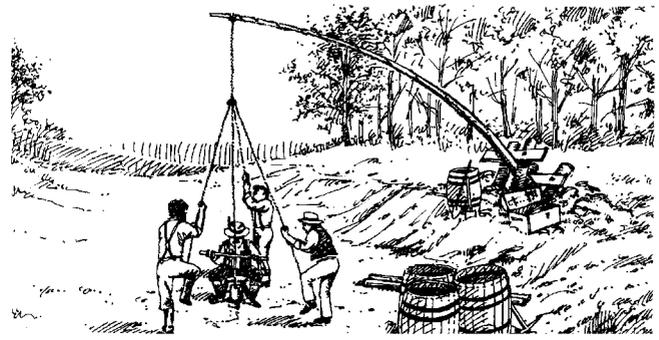


FIGURE 7. Near South Olive, in Noble County, Ohio, in 1814 two Ohioans drilling for brine, discovered oil — the first oil well in the United States. Drawing by Ohio Department of Natural Resources, Division of Geological Survey.

until several decades later in 1859 that the more famous oil “discovery” occurred in a commercial oil field in the Allegheny headwaters of the Ohio River at Titusville. Natural gas was discovered in the Kanawha Valley in Virginia (now West Virginia) in 1771 and oil in 1858. The boom-bust economy of Ohio Valley towns is also seen in Sisterville, West Virginia where its first producing oil well, named Polecat, was drilled in 1892. Drilling did not stop until Sisterville’s oil field was one of the greatest oil producing areas in the country. In fact, West Virginia led the nation in oil producing from 1911 to 1913.

COAL AND POWER PRODUCTION. The generation of electric power is now one of the most significant uses of the Ohio River and its tributaries because of the plentiful supply of coal in the region combined with the availability of the river for coal transportation and water for cooling and processing. There are presently 35,000 megawatts of electrical generation capacity on the Ohio River (Ohio River Valley Water Sanitation Commission 1986), almost all based on coal burning. There are also several firsts related to electric power in the Ohio River Valley. The Windsor Power Plant near Wheeling, West Virginia, is one of the first power plants built in the United States. There are also several firsts related to the control of pollution from these power plants. A water-cooling tower near the mouth of the Big Sandy River with the Ohio River near Louisa, Kentucky, is one of the first built in the United States. It stands 97.6 meters (320 feet) high and was built by the Kentucky Power Company to cool the water from its power generation plant so as to lessen danger of thermal pollution of the river (Havighurst 1970). On April 6, 1988, at Brilliant, Ohio, ground was broken for the nation’s first coal-burning power plant to use a fluidized bed combustion process. The technology removes air-polluting sulfur from the coal. The plant is being built by American Electric Power with financial help from the State of Ohio and the federal government and is operated by Ohio Power Company (Lafferty and Arrazola 1988).

CLAY. James Bennett built the first kiln at East Liverpool, Ohio, in 1840 to make china from rich deposits of potters clay. From this start, the pottery industry center of America grew in this region of Ohio, Pennsylvania and West Virginia with the largest plant in the world at Newell (Izant 1953).

IRON AND STEEL. There is a long and rich history of iron and steel production along the Ohio River and its tributaries, beginning with the Alliance Iron Furnace that was built in 1790 near Jacob Creek, a tributary of the Yoghiogheny River in the eastern part of the Basin. This was reported to be the first iron furnace west of the Alleghenies (Johnson 1978). Iron was discovered at Hanging Rock, in southern Ohio, in the 1820s, but iron-making had started across the river at the Argillite furnace in Kentucky in 1818. The first blast furnace to smelt ore in this region in Ohio was Union Furnace, established in 1826 (Mahoning County actually had Ohio's first iron furnace in 1804 (Lafferty 1979)). The nearby Vesuvius Furnace was established in 1833, and was the first to use the hot blast method of smelting. All the early furnaces used charcoal and put a heavy demand on nearby forests. Within 30 years, there were many furnaces on both sides of the river in the vicinity of Ironton. At Ironton, the Big Etna furnace was the largest in the world. Iron from the Hanging Rock region was also used to build the famous Union iron-clad ship of Civil War days, the "Monitor" (Stout 1942, Izant 1953). Ironton, Ohio, has the distinction of being the terminus of the first railroad in Ohio. It was used to bring iron ore smelted at historic Vesuvius Furnace, seven miles away. The cars were pulled by horses. Great steel and other industries developed in Pittsburgh and for 160 kilometers downstream on the Ohio River in the early 20th century as a result of the abundance of nearby coal resources and readily available river transportation. This industrial growth, in turn, caused smoke and heavy fogs to coat buildings with a sooty filth in many communities in the upper Ohio Valley. Famous architect Frank Lloyd Wright is said to have suggested about Pittsburgh during this time: "Abandon the place and rebuild anew" (Banta 1949). After 1935, however, the city enacted air pollution control laws, and the cleanup that followed afforded Pittsburgh recognition exceeded by no other city at that time, including losing its unrewarding title as the "Smokey City".

SALT AND SYNTHETIC CHEMICALS. The Kanawha River, as the fourth largest tributary of the Ohio, was used as early as 1808 as a navigation arm of the Ohio River. Even before that, the first salt furnace was started in 1797 to take advantage of extensive salt deposits found in the valley. Great salt works had been built along the Kanawha, and by 1817 some 700,000 bushels of salt were being shipped on flatboats to Cincinnati, increasing to 3,000,000 bushels by 1846. A 10-mile stretch became the largest salt-producing area in the country. As early as 1820, the Commonwealth of Virginia authorized improvement of the Kanawha River to accommodate this developing industry. By the turn of the century, the Kanawha River, in the vicinity of Charleston, West Virginia, had become a major center for the production of chemicals, an extension of its beginnings with salt development and also resulting from the abundance of coal, oil, and natural gas in the region. This development, which first included the production of chlorine, caustic soda, alcohols, aluminum chloride and alkali, was accelerated during the two world wars when foreign supplies of chemicals were restricted (Waldron and White 1989). Along with becoming

one of the world's largest chemical manufacturing centers, the region also became infamous for serious deterioration of the quality of the air and water. There has been dramatic improvement in the quality of the Kanawha River and the atmosphere in the Kanawha Valley, but suspected toxic problems remain with the river sediments (Waldron and White 1989).

AQUATIC RESOURCES

Constantine Rafinesque (Fig. 8), an instructor in natural history at Transylvania University at Lexington, Kentucky, published a book in 1820 on fishes of the Ohio River based on his travels down the Ohio River. That publication, with the title "Ichthyologia Ohien-sis" or "Natural History of the Fishes Inhabiting the Ohio River" (Rafinesque 1820), is the first scientific report issued separately on the Ohio River (Banta 1949). Before that study, only a few references had been made to Ohio River fishes, with the most notable being by C. A. Lesueur, one of the scientists later aboard the important "Boatload of Knowledge" trip down the Ohio (Pitzer 1989). The study by Rafinesque drew some criticism, and many of the species that he listed are no longer recognized (Pearson and Pearson 1989). The author eventually turned to making patent medicine and studying social issues (Pearson and Krumholz 1984).

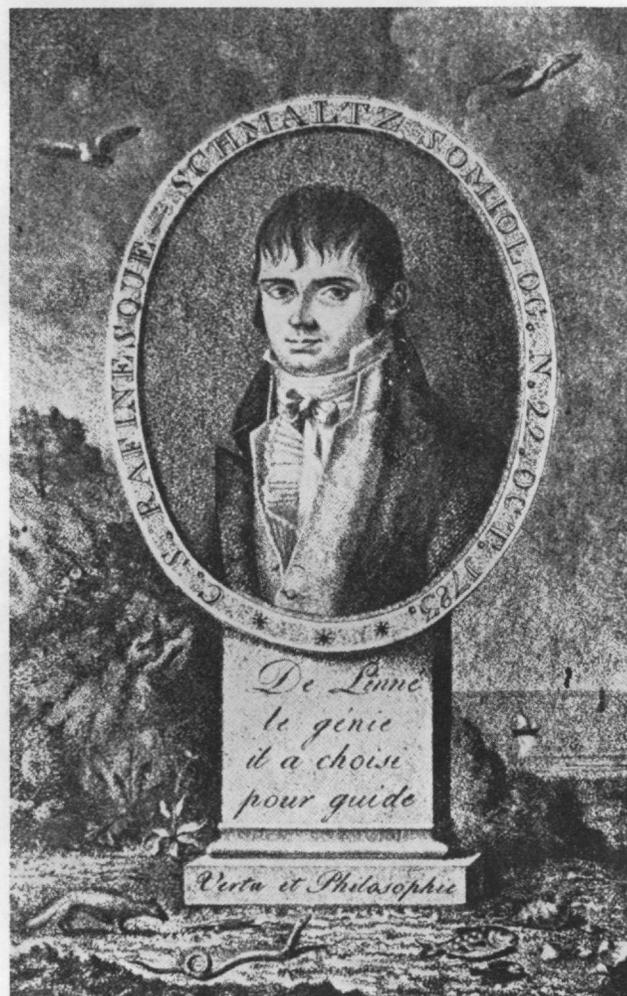


FIGURE 8. This drawing of Constantine Rafinesque appeared in his book "Ichthyologia Ohien-sis," published in 1820 about the fishes in the Ohio River. From Ohio Historical Society.

Although there have been few attempts to develop commercial fisheries in the Ohio River, there have been several periods of commercial ventures based on freshwater mussels found in the River and several of its tributaries. These waters were, and to a lesser degree today are, a habitat for several species of fresh water mussels, many of which were also documented first by Rafinesque (1820). For centuries before that, Indians harvested the mussels for food and used the shells for pottery and jewelry (Taylor 1989). In fact, the investigation of discarded shell material (shell middens) from Indian encampments is one of the most useful methods for reconstructing the natural history of mussels in the river (Taylor 1989). In more recent times, buttons were made from the mussel shells and the Ohio River supported a significant button industry for a time. While that industry is essentially defunct, the Japanese now import mussel shells from the Ohio River to use in the culturing of pearls. Pollution and construction of the navigational dams have eliminated many species of mussels in the Ohio River (Taylor 1989).

AGRICULTURE AND HORTICULTURE

Manasseh Cutler was a leader in the writing of the Northwest Ordinance of 1787 and helped to organize the group which founded Marietta. He was also an accomplished horticulturist and botanist. Seeking to have botany taught in America's colleges, he collected plants and wrote some 30 botanical notebooks. One of his manuscripts is preserved at Ohio University, where Manasseh Cutler Hall was the oldest building in the Northwest Territory for higher education (Izant 1953, Dawes 1972). In 1789, Israel Putnam came to the Marietta colony and grafted a few apple trees with scions from Massachusetts. In 1790, the Dana orchard on the Muskingum was established, followed by Putnam's nursery in 1818. Trees were sent from it to all the Ohio River counties. In 1789 the first crop of wheat was harvested at Marietta (Lloyd et al. 1918).

A. A. Ernest, a pioneer horticulturist, established an experimental orchard with nearly 600 varieties of apples and 700 varieties of pears in the Cincinnati area in the early 1800s. Nicholas Longworth planted the first grape vineyards in 1818 in Hamilton and Clermont Counties within 20 miles of Cincinnati. By 1850, the Ohio Valley, with much of the activity in the Cincinnati region, led the nation in wine-making. Mr. Longworth was called "the father of successful wine culture in the west" (Lloyd et al. 1918). By 1910, grape production had shifted largely to six counties in Ohio along Lake Erie because of the more favorable growing conditions.

By 1813, Steubenville, Ohio, was considered the wool center of the West, its fame dating back to 1797 when Bezaleel Wells introduced Merino sheep and started making wool. At Mt. Pleasant, near the southern border of Jefferson County near Steubenville, mulberry trees were planted at one time for silkworms for a local silk industry (Izant 1953).

There is a site marked near Wellsburg, West Virginia, in the upper Ohio Valley where an original Grimes Golden appletree once grew. It is said to have provided the buds from which the trees of today came (Brant 1978). Johnny Appleseed (Jonathan Chapman) is credited with having planted the first tree there; he also

became a legend in Ohio with his wide-ranging apple-tree planting. He is now commemorated in the annual Johnny Appleseed festival at Lisbon, Ohio.

The first floating mill on the Ohio River was operated at the mouth of the Hocking River in southern Ohio in 1791. It could grind 40 bushels of corn in an hour. It was built of two boats made from hollowed trees, across which a huge planking deck was affixed and from which a millstone attached to a waterwheel was suspended. The mill was anchored in the river and the current did the rest (Lloyd et al. 1918).

In Lawrence County, Ohio, near Proctorville, in Rome Township, Alanson Gillette planted a runt apple tree his father had brought from Marietta in 1817. It produced a much-sought-after apple which was labeled the "Rome Beauty," and has since been widely planted (Lafferty 1979).

In the 1840s, Cincinnati became the nation's great hog and bacon shipping and processing center and carried the name "Porkopolis." This led to the start of Proctor and Gamble, which used the fats for soap-making. By the mid 1800s, Louisville was second to Cincinnati in pork production and was the world's largest tobacco market.

Cincinnati was, in 1881, the location of the first American Forestry Congress, at which over 25,000 participated in huge tree-planting ceremonies. That Congress drafted proposals to alert the nation to the care of its forest lands (Butler 1941). In 1885, the state created its first state forestry bureau at The Ohio State University but it did not last long. State forestry administration was started in Pennsylvania in 1895. Ohio's first state fair was held at Cincinnati in 1850.

EROSION

If the forested hills were holding the soil, that was not the case of the banks of the Ohio River. Over 100 years ago, erosion was of such concern that Ohio passed a law in 1876 that required landowners to give a day of labor each year to plant willows along the river banks; this was believed to be a first of its kind for river bank stabilization (Frost 1976). Erosion of the banks of the Ohio River in southern Ohio and northern Kentucky remains, and much controversy surrounds the role of the dams on the river in the erosion process.

PUBLIC HEALTH AND WATER QUALITY

Ague, usually called "ager" or "the shakes", was a common disease from the swamp lands along the lower Ohio. Clouds of mosquitos came from the swamps, but their link to what was later to be called malaria had not been discovered. Some of the early doctors, drawing from the cures of the Indians, were called "Indian Doctors." They published medical guides for the citizenry. One of the early such guides came from Father Peter Smith, published in Cincinnati in 1813, and another came later from Richard Carter and S. H. Selman. Dr. Daniel Drake opened the first public hospital at Cincinnati in 1830. In 1822, many ponds in the Louisville, Kentucky, area were believed to be the source of much disease and sickness (malaria) in the summer. The tragedy of many deaths rallied action to drain and fill the ponds. A lottery was held to raise money for a "pond fund." An engineer was hired, and drainage became the

main public work for the next six years. In the early 1800s, typhoid fever caused by polluted water was a serious problem in Louisville. Yellow flags were flown as a warning from houses when the sickness was present (Yater 1979).

In 1913, the Public Health Service established the Ohio River Investigation Station at Cincinnati. It pioneered the first river basin pollution control concept for the nation and was a major reason for the passage of the Water Pollution Control Act of 1948, the first move toward a national program for clean water that is still functional. In 1924, the U.S. Surgeon General called a conference of Health Commissioners of Ohio, Pennsylvania and West Virginia to consider the problems of pollution in the Ohio River Basin. This activity created the Ohio River Interstate Stream Conservation Agreement. By 1929, seventeen of nineteen coke-industry by-product firms had voluntarily installed phenol-elimination devices (Tarr 1985).

The Public Health Service station at Cincinnati trained water quality experts and made studies of the scientific principles of pollution. It published a report in 1925, which became a classic titled "Factors Concerned In the Phenomena of Oxidation and Re-aeration" by H. W. Streeter and E. B. Phelps (1925). These men then pioneered the development of a mathematical model which predicted the effects of waste discharge on water quality (Thomann 1972). It was to be adopted by many state health departments, and variations of the "Streeter-Phelps model" are still used for wastewater allocation and reduction programs. Mr. Streeter later became director of the Public Health Service laboratory and was recognized as an international authority on water pollution. His guides were adopted for wastewater treatment throughout the Ohio River basin.

In 1948, the Robert A. Taft Laboratory was dedicated as an extension of the work started in 1913 by the Public Health Service. In 1966, it came under the Federal Water Pollution Control Administration in the Department of the Interior, and in 1970 it became part of the newly-formed U.S. Environmental Protection Agency (EPA). The EPA environmental programs in Cincinnati were enlarged with the completion of the Andrew W. Breidenbach Environmental Research Center in 1975.

On June 30, 1948, President Harry S. Truman signed Public Law 845, the nation's first Federal Water Pollution Control Act, which included authority to establish interstate pollution-control compacts. On that same date, the governors of the Ohio Valley met in Cincinnati to put their signatures on the document creating an interstate Ohio River Valley Water Sanitation Commission (ORSANCO) to fight the growing water pollution problem in the Ohio River. At that time, only one percent of the communities along the Ohio River had adequate sewage disposal. The move to create ORSANCO for a regional effort on pollution control started in 1935 with efforts of Hudson Biery, leader of the Cincinnati Chamber of Commerce, and William F. Wiley, editor of the Cincinnati Enquirer. As a result of this effort, a valley-wide educational program was started, new state laws were passed, industrial committees set control standards for industrial wastes, and many new pollution control installations were made.

The accomplishments reported by ORSANCO show that nearly 100 percent of the industries in the Ohio River Valley had treatment facilities by 1975 compared to one percent in 1948. By 1975, almost 100 percent of the population in the Ohio basin was served by sewage treatment facilities compared to 38 percent in 1948. The world's first robot water quality monitor system was developed by ORSANCO in 1960 (Cleary 1967).

EPILOGUE

United States Supreme Court Judge Holmes once wrote: "A river is more than an amenity, it is a treasure." The long history of the Ohio River has touched many lives in many ways, and our story of its waters and resources is but a part of a bigger history, one that is still being made, of which President Hoover said at Cincinnati in 1929, "... with each generation it will grow in the history and tradition of our nation" (Johnson 1974). Michaux (1804) saw all this future with an amazing perception almost 200 years ago when he wrote: "The position of this river (Ohio), the most happy which can be found in the United States, will cause it to be considered as the center of activity of the commerce between the eastern and western states; it is by that the latter receive the manufactured articles furnished to the first by Europe, India and the Antilles, and it is the only channel of communication open with the ocean for exporting the produce of that vast and fertile part of the United States comprised between the Allegheny mountains, the lakes and the left bank of the Mississippi."

"All these advantages, added to the salubrity of the climate and the beauty of its situations; enlivened, in the spring, by crowds of loaded boats, hurried on with incredible rapidity by the current—all of those advantages, I say, make me look to the banks of the Ohio, from Pittsburgh to Louisville, both included, as being likely to be, within twenty years, the most populous and most commercial part of the United States. It is also that to which I should not hesitate to give the preference, in choosing my place of residence."

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