

THE

RIVER

IN

THE

CITY

The Urban Ecosystem

Introduction

Most rain falls into the oceans but the lesser amount that falls on the land is absorbed by roots of plants and is transpired back into the atmosphere, is percolated into the soil, or is collected into depressions forming lakes, and some evaporates. In addition, a great deal of the rain that falls on land runs off into the streams, creeks, runs, licks, and rivers.

A river can be of any size and its depth and flow may vary from time to time. The Mississippi-Missouri River is the longest on the North American continent, while the Virgin River that runs through Zion Canyon in Utah is little more than a creek. During periods of heavy rainfall, the Freemont River in Central Utah becomes a roaring, rampaging flood, but in times of drought it can be easily forded on foot or on horseback. The rivers drain the continent, carrying silt, salts and nutrients, rocks, stones, pebbles, and gravel to the sea. The flow of the water responds to the pull of gravity and rivers follow the least resistant course.

Some of the most interesting rivers in the United States have formed as a result of glacial activity. There seems to have been a time, prior to the Wisconsin glacial period, when a great river system originated somewhere in the mountains of Tennessee or North Carolina and flowed north and westward through what is now the Kanawa River Valley of West Virginia. It crossed the Ohio River Valley, continued to the Scioto River Valley, probably connected at some point with the Wabash or the Illinois, made a loop to the west connecting the Mississippi River drainage, heading south in mid-continent.

The system of rivers that included the Kanawa River which flows through Charleston, W. Va., to the Ohio River which, in turn, flows from Pittsburgh through Portsmouth, and the Olentangy which joins the Scioto River at Columbus, Ohio, and flows through Circleville and Chillicothe to the Ohio, all resulted from the Wisconsin glaciation. The Kanawa River flows north to the Ohio in a river valley that widens as it proceeds northward, while the Scioto narrows as it approaches the Ohio River. It is an interesting geological phenomenon, for apparently the continental glacier blocked the flow of the rivers to the north, impounded the water, and formed lakes—the beaches of which can still be found—and as the glacier retreated, a sufficient amount of debris was deposited in the river valley to reverse the flow of the stream. The Ohio River Valley formed at the edge of the melting glacier and represents a new river that was cut from part of several river valleys. The drainage flowed to the southwest because in that direction lay the lowest point in the ridge of mountains where the impounded water in front of the glacier could flow. A water gap was cut at Portsmouth, Ohio, and the river continued to flow in that direction.

The Mississippi, Missouri, and Ohio Rivers drained the great continental glaciers and the entire river system of the North American continent was



influenced in some way by the glaciation, to the extent that it is now difficult to determine what the land surface and the river systems were like originally.

The more common word for drainage is watershed, which can be defined as an area of land that is drained by a single stream or creek. But streams and creeks flow into rivers, so in the larger sense of watershed we really mean the river drainage; hence, the Ohio watershed, the Monongahela watershed, the Allegheny watershed, the Conomaugh watershed, and so forth.

It was an unfortunate accident of history that when the Upper Mississippi was discovered, the significance of the tributary at the confluence of the Missouri was poorly understood; for if we look at the river system of the central continent, it is obvious that the continuous river system is the Mississippi-Missouri, and that the Upper Mississippi is merely a tributary of this great river system. The specifications for the Louisiana Purchase were that it should comprise all of the land drained by the Mississippi-Missouri River system. It is easy to understand why Thomas Jefferson was so anxious to acquire the port of New Orleans since it was the gateway to the continent as it was known at that time.



Photo by U. S. Department of the Interior

The great river systems of the North American continent were the avenues by which the continent was explored. The search for a Northwest Passage was an attempt to find rivers or other water passages that would lead from the Atlantic Coast to the Pacific Ocean. The Northwest Passage was never found, although technically one exists when not frozen over by arctic ice. However, the rivers that rise on the eastern seaboard made it possible to push westward, a pioneering effort that eventually continued to the Pacific Ocean.

The Chesapeake Bay, the Hudson River, the St. Lawrence River, and others all played an important role in the trek West, but it was the mighty Mississippi-Missouri River with its route unhindered by falls that made possible the exploration of the continent as far as the Rocky Mountains. Canoes and sailing craft, pole boats and rafts, and other water-borne conveyances were the first means of transportation into the interior, and canal construction was essential in order to stabilize the water system, make it controllable during flood and drought, and remove the uncertainty from water navigation.

The Chesapeake Bay, which is entered by six major rivers (Susquehanna, Patuxent, Potomac, Rappahannock, York, and James) as well as many smaller rivers and estuaries, was the principal area of early settlement and the Potomac River, flowing from the hinterland near the Monongahela and Ohio River systems, became an important water route for the transportation of materials and people into and out of the heartland of the country. The escarpment of the Potomac River at Great Falls made it necessary to seek routes around the rapids, falls, and gorges and the Chesapeake and Ohio Canal had its beginnings in a company organized by George Washington, although the C&O was formally begun as such by John Quincy Adams. This combination of river and canal circumvented the falls and rapids and established a navigable route into the interior. Later, using water from the river, the C&O Canal was extended to Cumberland, Maryland, and the traveler was free of the vagaries of the river and the uncertainties of water levels. Thus, the movement of materials and supplies in and out of the interior of the continent became a fairly routine undertaking. Cumberland became an important transfer point where cargoes were transhipped into the Monongahela River system to be floated downstream to Pittsburgh and the Ohio Territory.

In the eastern United States the rivers that flow out of the Appalachian Mountains almost always cross a line of resistant rock that does not submit easily to erosion. As a result, most of the rivers flowing from the Appalachian Mountains to the Atlantic Ocean are studded with falls similar to the Great Falls of the Potomac. These falls made inland navigation extremely difficult, but water transportation was so essential to early settlers that it was considered worthwhile to construct canals bordering the rivers for safe, easy transportation routes.

The rivers and canals served as a means of transportation for many years, but in time the railroads proved to be a faster, cheaper way of moving goods over the vast distances and eventually they replaced most of the inland, waterborne commercial transportation. The Erie Canal and the Mohawk Canal in New York are among the few that have survived and that operate in modern commerce, but the C&O Canal was overwhelmed by the competition from the Baltimore and Ohio Railroad and went out of business. Now that the C&O Canal is being restored as a National Historical Park, it will represent an example of living history in a national recreation area ideally situated for convenient access by large numbers of urban dwellers. The operation of the locks and the movement of barges on the Canal will provide a vivid demonstration of our national heritage as well as outdoor recreation in a national park for nearby residents and visitors.

In an age of superhighways and jet planes, it is difficult to comprehend the enormous difference between the difficult and hazardous overland route through deciduous forests and the relative safety of the river system that brought the traveler to the same destination.

While the rivers functioned as the principal means of transportation, they also provided the basis for great adventures as Mark Twain's "Huckleberry Finn" testifies. In addition, the sternwheelers, the pleasure and excursion boats, and the showboats constituted a romantic and gallant way of life that many Americans look back on with nostalgia. With the advent of railroads, however, people shifted from water transportation to the new iron horse and, at the same time, the users of the rivers for industrial transportation and sewage disposal increased and brought about the decline of the river, a decline that with few exceptions continues to this day.



Photo by U. S. Department of the Interior

In the middle of the 18th century the United States was engaged in a large and lucrative fur trade with Europe, and most of the furs were found along the river systems of eastern North America, and later around the lakes and river systems of north central North America. The great canoe route from central Canada to Montreal traversed the lakes and some of the slow-moving rivers of southern Canada, proceeded via Lake Superior, the French, Mattawa, and Ottawa Rivers and finally to Montreal and the St. Lawrence River system, the gateway to Europe. By this route furs were carried in canoes and sailing vessels from the interior of the continent to Europe.

Beaver was an extremely important item in this fur trade, and on the Ohio River in western Pennsylvania a county that borders on the State of Ohio has place names that testify to the role that beaver played in the area. The county is, of course, Beaver County. The county seat is Beaver, Beaver Falls is one of the larger towns, and the Ohio River Valley, as it runs through the county, is known as the Beaver Valley. In addition there is Beaver Creek and the Beaver River. The disappearance of the beaver from Beaver Valley is symbolic and connected with man's technological development of the river systems, rising industrialization, and change in the priorities and values associated with the river systems. All of these factors altered the river systems biologically as well as technologically and forced them to serve the needs and purposes of man. The flood plains have been occupied, the wetlands and marshes filled, the tributary streams channeled elsewhere, and the major river systems drained and dredged for flood control.

The installation of locks and dams on the rivers did two things: regulated the flow of water making it independent of the season of the year, and converted the flowing rivers into what were essentially a series of flat lakes with locks that permitted the movement of barges through the various levels.

Prior to the construction of locks and dams and other aids to navigation, traveling most rivers was a hazardous business. It required great skill to negotiate the rapids and similar obstacles and necessitated transfer points to go around the rapids. The Lower Mississippi, of course, still has no locks or dams to regulate its flow and from the point of view of river travel, it remains an extremely dangerous river. It has currents and eddies, it is wide and sweeps around bends at fairly high velocity, and it is prone to floods. The surface of the river is higher than the surrounding delta country, making floods a constant threat. On the Lower Mississippi, flood control is primarily a spin-off from the preventive flood control on the Upper Mississippi, the Ohio, and the Upper Missouri, although it should be noted that stabilized levees, paved river bottoms, overflow diversion channels and sluices, and hydraulic pumps on the Lower Mississippi represent an outstanding example of the engineered environment.



While the rivers made transportation, exploration, and commerce possible, they also served as a water supply, a source of bulk chemical water for industrial processes. Moreover, the river served as an open sewer for the industrial and municipal wastes that resulted from the industrialization itself and from the cities that developed around it.

It was a natural development that railroad rights-of-way followed the river valley. Such a procedure made for easier construction, for easier movement of materials to the construction site, and also eliminated the need for more bridges and trestles to accommodate the railroad rights-of-way across valleys. Along the Upper Mississippi, railroad rights-of-way occupy both banks and obstruct from view and use one of the most scenic rivers in the United States.

This must be viewed as an outmoded way of locating highspeed rail transportation. The interstate highway program has demonstrated that roads and bridges, and by extension, railroad tracks, can be built economically by taking the shortest distance between two points. Thought should be given to the possibility of opening up the shoreline of rivers for recreational development by rerouting some railroads and combining them with highways in common transportation corridors.

In a technological age this should not be an insurmountable task. Moreover, the relocation of railroads away from the river valleys might induce some heavy industry to follow this example and thus free additional land adjacent to rivers for alternative development.

The great cities that were built along rivers in order to take advantage of their transportation potential, their water supply, and as a means of disposal of wastes altered the character of the rivers from a wild, untamed state to floating garbage pails, rendering them unfit for human use and destroying wildlife habitat.

In the early days of exploration and expansion, there were sound reasons for locating cities on the coast at good harbors, at the confluence of rivers, or at other river locations where water power and water transportation were available. This is true of Boston on the Charles River; Minneapolis-St. Paul near the confluence of the Mississippi and Minnesota Rivers; and Philadelphia on the Schuylkill and the Delaware. Springfield and Hartford are two cities strung like beads on the Connecticut River, while New York has the picturesque Hudson, the Harlem, and the East Rivers. The Ohio starts at Pittsburgh as the confluence of the Allegheny and the Monongahela Rivers and runs through the industrial heartland of Pennsylvania, West Virginia, Ohio, and Kentucky. In its first 50 miles the Ohio passes through McKees Rocks, Bellevue, Ben Avon, Avalon, Corapolis, Sewickley, Leetsdale, Ambridge, Aliquippa, Baden, Conway, Freedom, Monaca, Rochester, Beaver, Vanport, Midland, East

Liverpool, Wellsville, Empire, Toronto, Winton, Steubenville, Mingo Junction, Follansbee, Brilliant, Wellsburg, and Wheeling. From West Virginia the Ohio River runs through Marietta, Parkersburg, Huntington, Portsmouth, Cincinnati, Covington, Lexington, Evansville, Paducah, and Cairo, at the confluence of the Ohio and the Mississippi.

Similar lists of towns could be made for the Mississippi-Missouri Rivers which drain the heart of the continent; the Platte of the high plains; the Potomac and Susquehanna flowing through the mid-Atlantic states to Chesapeake Bay; the Connecticut running south through New England; the Hudson River in New York; the Tallapoosa and the Coosa running through Alabama; and the Rio Grande in the Southwest, forming our common boundary with Mexico. All these rivers and many more were the transportation corridors of the developing continent and also the lifeblood and source of prosperity for the cities, towns, and villages that were established on the shores and at the confluences.

Industrial development in the United States followed the pattern of water power development and transportation facilities. The industrial development of New England, with its small factories located on streams that were essential to the water power in use in the late 18th and early 19th century, contrasts sharply with the large industrial developments that occurred further inland, but the principle is the same. Here steel mills and other heavy industry occupied vast flood plains and the rivers served as avenues of transportation for goods to the consumer and of coal to the coal-burning, steam-generating power plants that, in turn, supplied the electrical energy necessary to power the industries.

The Ohio, the Upper Mississippi, the Missouri, the Kanawa, the Chicago, and many other rivers were essential to the development of natural resources and to the manufacture of goods of every kind. As a result, they were regarded as convenient adjuncts to the industrialization process and the viability of the rivers as ecosystems was ignored.

When the rivers became the common method of sewage disposal as well as the main source of water supply for the cities located along their banks, chemical water treatment plants became necessary. Early water treatment was a simple mechanical filtration through beds of sand, plus chlorine for bactericidal purposes. Those cities having more advanced water treatment facilities added the refinement of a water softener in the form of salts precipitation, and in this way the city's water supply was potable as well as acceptable as a cleaning agent. This procedure treated the water as a bulk chemical and the water inlets and outlets might, and often were, in close juxtaposition to each other in the river. The standard practice was to drill wells into the river bed and to filter the water through the sand beneath the bed. The water was river water, but some filtration had taken place. Modern water treatment plants often must cope not only with the public health problems of

sewage but with heavy metals such as mercury, zinc, cadmium, and lead, with acid sulfate wastes, with nitrate from agricultural fertilizer runoff, with excessive phosphates, and with a host of pollutants from the manufacturing, extracting, and agricultural industries.

As a consequence of industrialization and the burgeoning population in our metropolitan areas coupled with the barest minimum in sewage treatment facilities, no major river in the United States has water that is fit to drink untreated today, and none is fit for body-contact water sports. It is hard to believe that the Chesapeake Bay, the Hudson River, and most of the Atlantic Coast once boasted salmon runs and that rivers such as the Ohio River were the habitat for pike, sturgeon, and bass. Furthermore, there was a time, difficult to imagine, when prized game fish and many of the most prized fur-bearing animals were common along the flood plains, wetlands, tributaries, and estuaries of the major river systems of the United States.

In 1970, the spring runoff from the frozen agricultural uplands of Maryland and Virginia dumped unusually large quantities of nitrogen compounds into the Potomac River. The water purifying equipment could not cope with the pollutant, and a foul-tasting water supply resulted. The beneficiaries were suppliers of bottled water whose stocks were quickly exhausted. A large number of people resorted to collecting and boiling rainwater for domestic use until the quality of the faucet water was restored. Sediment is the main problem created by agricultural runoff, and the many water impoundment facilities constructed in recent years have done much to alleviate the problem. There are now some 1000 dammed watersheds that trap much of the sediment but an equal number are still needed.

The Cuyahoga River in Ohio was created by the Wisconsin glaciation. It rises near Cleveland, a few miles from the shore of Lake Erie, runs southward through the town of Kent, Ohio, westward through Cuyahoga Falls, west and north through Akron, and finally back to Cleveland, where it enters Lake Erie about 30 miles from its source. At Kent, the river goes over a falls in the middle of town and flows through a series of falls to the next town, Cuyahoga Falls, and finally into Cuyahoga Gorge, which is wild and scenic. The Cuyahoga River from Kent to Cuyahoga Falls, through Cuyahoga Gorge, qualifies as a wild scenic river by any standard. As the river goes through Akron, however, it becomes an outlet for industrial wastes, and as it flows through Cleveland it becomes an open sewer for heavy industry and for the city of Cleveland. This river, which is 60 or 70 miles long, is part pristine beauty and wilderness and part polluted sewer that not long ago actually caught fire!

It is ironic that New York City, one of the great cities of the world, traditionally suffers from a shortage of water, even though it is situated on the banks of the Hudson River, one of the greatest sources of freshwater on the eastern North American continent. Pollution makes it impossible to use the water from the Hudson as it flows through New York City and supplies must be brought from reservoirs miles up river to the metropolitan area.



Photo by U. S. Department of the Interior

When the great power projects were installed in the western United States, the impounded water was usually converted into a recreation area. Hoover Dam forming Lake Mead gave us the Lake Mead National Recreation Area. Glen Canyon Dam forming Lake Powell became the Glen Canyon National Recreation Area, and so on. Yet the great dams that were built on the Ohio River, Upper Mississippi River, and other navigable rivers of the eastern and central United States were not accompanied by official recognition of their recreational potential, even though they are the habitat of game fish and migratory birds, have interesting plant and animal communities, and could be as much a source of enjoyment for city residents as any body of water anywhere.

Moreover, these rivers are easily accessible to urban dwellers. New Yorkers have ready access to the East River, the Harlem, and the Hudson, as do Pittsburghers to the Ohio River, the Monongahela, and the Allegheny; Akronites to the Cuyahoga River; Bostonians to the Charles River; and any number of other cities located on large and small waterways. A group of New Yorkers recently made a 120-mile canoe trip on the waterways of New York and never lost sight of the city. True, they encountered a good many problems including oil slicks that fouled some of their equipment and pilfering at piers where they stopped along the way, but they proved that it is possible to take a 120-mile canoe trip without leaving the environs of New York City.

Most of the great rivers of the United States that run through large cities have flood control and navigational aids that make the rivers safe to use. In essence, these man-made alterations to the river create a series of oblong lakes with little current. If one drives from Pittsburgh south toward Steubenville, Ohio, Huntington, W.Va., and Cincinnati, Ohio, one is struck by the fact that the many cities, towns, and villages do not front on or look toward the river, but have turned their backs and left the river abandoned on the other side of the tracks.

The Ohio River is a peculiar one formed by the drainage of the glacier, and its walls are relatively steep, its flood plains relatively narrow, and in the cities, towns, and villages of the Ohio River Valley there are stretches of river bank that are wild and scenic, but little used. Until recently, the pollution and acid content of the Ohio made it virtually impossible to engage in any form of water sports, and to swim was to expose oneself to the dangers of waterborne diseases. In 1949, the seven states bordering the Ohio River entered into a compact to clean up the river and there has been considerable progress. The result is a revitalizing of the area with marinas and pleasure boats and the development of other services associated with the life of the river. But swimming and water contact sports are still not recommended.

But the Ohio effort notwithstanding, the waterways in most of our cities are wasted resources. A beautiful river runs through the resort town of Estes Park, Colorado, but it is not visible from the town. The city faces a main street, while the river runs through the back of the town, out of the way and encased in concrete. Engineering skills have made the river easy to cross but it cannot be used by residents or visitors. The exception is the tenant in a back room of one of the enterprising hotels that face the street and back onto the river. These advertise "Fishing from your own back porch," and the fish are trout! The commercial potential of the river has not been developed as it could be if the shore were a city park, a place for people to meet, to stroll, and to enjoy, as well as to fish.

Such development has taken place on the Ohio River near Empire, Ohio. When the Cumberland lock and dam were installed, the river backed up into Yellow Creek, a little stream between Toronto and Wellesville, Ohio, deepening the creek and creating an environment favorable for a marina. So far, it remains inadequately developed but it provides facilities for a number of boats and for a recreational area on the stretch of the Ohio River that is accessible to many people.

Excursion boats once operated between cities located on rivers and amusement parks at sites some distance up or down stream, such as Rock Spring Park near Chester, West Virginia. In Pittsburgh today an excursion boat carries passengers onto the Allegheny and Monongahela Rivers. The boat is a floating nightclub whose patrons can select from among several dance floors featuring different styles of music, and for the 3-hour trip they remain within sight of the city and can view its skyline from a new perspective. The University of Minnesota maintains a link with the past with a showboat that takes theatrical productions to river towns on the Upper Mississippi. The University acquired a river packet, the *General John Newton*, from the U.S. Army Corps of Engineers, rebuilt the superstructure in the form of a small theater, and launched its career as part of Minnesota's centennial celebration.

There is no doubt that a thriving recreation industry could be developed on most rivers of the United States, and such development would be most appropriate, not to say profitable, at places where the river runs through heavily populated areas. The impoundment of the rivers for flood control and for navigational purposes and the utilization of the rivers for municipal water supplies are in no way incompatible with the use of the rivers for recreation. This is not to suggest that all rivers should be impounded and made into lakes, for obviously many wild and scenic rivers should be preserved precisely as they now are.





If the rivers in our cities were clean, if the water were potable, and if the water had its natural biological, physical, and chemical properties restored, how could they be used? Obviously, the rivers could be used for swimming, for fishing, and for water skiing, and they could be the starting point for hunting trips, for canoe rides, and for excursion boats and showboats. A few cities already have restaurants floating on barges in their rivers.

But much of the waterfront of many of our large cities is in a rundown industrial area. The city of Pittsburgh held an exposition in the 1880s and the exposition building sat on the bank of the Allegheny River until after World War II. In 1940, a visitor seeking the remains of Fort Pitt's blockhouse was directed to a hole in the ground that was a repository for tin cans and waste paper.

Today, Fort Pitt in the Triangle Park development demonstrates what a little civic pride can do. The old exposition building is gone too, but the possibilities for development of stretches of the Monongahela, the Allegheny, and the Ohio Rivers still escape the riverfront real estate developers and others interested in introducing new business into the area.

The City of San Antonio, Texas, agonized over the problem of the San Antonio River as it passes through the downtown section of the city, and proposals included covering it with a street as an aid to flood control and sewage disposal. Happily, the more rational views of civic leaders, businessmen, landowners, and real estate developers prevailed, and today the 3.5-mile stretch of river has gained national attention as the Paseo del Rio. It is a charming development of shops, restaurants, promenades, and parks that not only enhance the beauty of the city but also provide a recreational area for residents and visitors. Flood control, planning, zoning, business enterprise, and civic pride made it possible and it has become a model for urban development of waterfront property. The long-range plans for San Antonio include expansion of this concept on the river.

The number and kinds of activities that can be developed on a river recreational area are almost unlimited and will be the basis for a whole new industry centered around marinas, boats, sporting goods stores, restaurants, pleasure trips, and second-home sites. For those less energetically inclined, the rivers will once again provide excellent opportunities for observing nature and enjoying the scenery of the countryside. The recreational development of the rivers in the cities will require some precise and stringent regulations relating to sewage and solid waste disposal, as well as methods of enforcing such regulations. Some limitations of power boats and water skiing might have to be imposed, particularly at narrow stretches of the river, and regulations that would promote the harmonious intermingling of

commercial and recreational traffic on the river would undoubtedly be required. In some areas, particularly at locks, appropriate regulations are in force and aids to navigation and law enforcement on the nation's waterways are provided by the U.S. Coast Guard.

It is interesting to speculate on recreational areas for cities and to consider that most of the large cities of the United States have many miles of riverfront and hundreds of acres of river. Much of this acreage is in public ownership and much of it is available for immediate use and could be developed for recreational purposes. The present practice of river use is based on single factor cost-benefit ratios, where the cost of cleaning up the river is balanced against costs that are related in terms of reducing costs of water treatment. If the sewage water could be cycled so that its nutrients were utilized for the benefit of the cities and the surrounding agricultural communities, what benefits would be derived? If the efficiency of industrial processes is considered, the cost-benefit ratio can be analyzed from the engineering as well as the environmental point of view. Significant quantities of valuable materials are dumped into our waterways and their recovery is extremely difficult, but these materials could be salvaged at the source with relative ease. The tons of acids from heavy industry that enter our rivers and the quantities of valuable elements that arrive via industrial sewers destabilize or destroy the aquatic ecosystem, deprive man of the use of the rivers except for transportation purposes, and may seriously affect the public's health. Viewed economically, what is the market price of one million pounds of sulfuric acid that is dumped into an eastern river daily? What would be the savings if the acid was recovered for further use? To what extent do these contaminants alter the cost-benefit ratio of river development?

If one figured the cost-benefit ratio of using the Cuyahoga River as an open sewer as against using it as a scenic recreational area, one might discover that the ratio is not overwhelmingly in favor of industry and an open sewer. Only when the cost-benefit ratio is calculated on single uses does the open sewer concept appear to have merit and only then because the river itself is deemed to have no value. For instance, the comparative cost between allowing industrial wastes to enter the river or building industrial water treatment plants is clearly in favor of the former. But if the cost of treating the municipal water supply—essential when the water is industrially polluted—the balance moves in the other direction. If the cost of illness and disease, the value of wildlife, and the value of hard cash-on-the-barrel recreational potential is included in the equation, the cost-benefit ratio tips further away from the use of the river as an industrial and municipal sewer.

When the interests of the total ecological community are ignored in favor of some of its

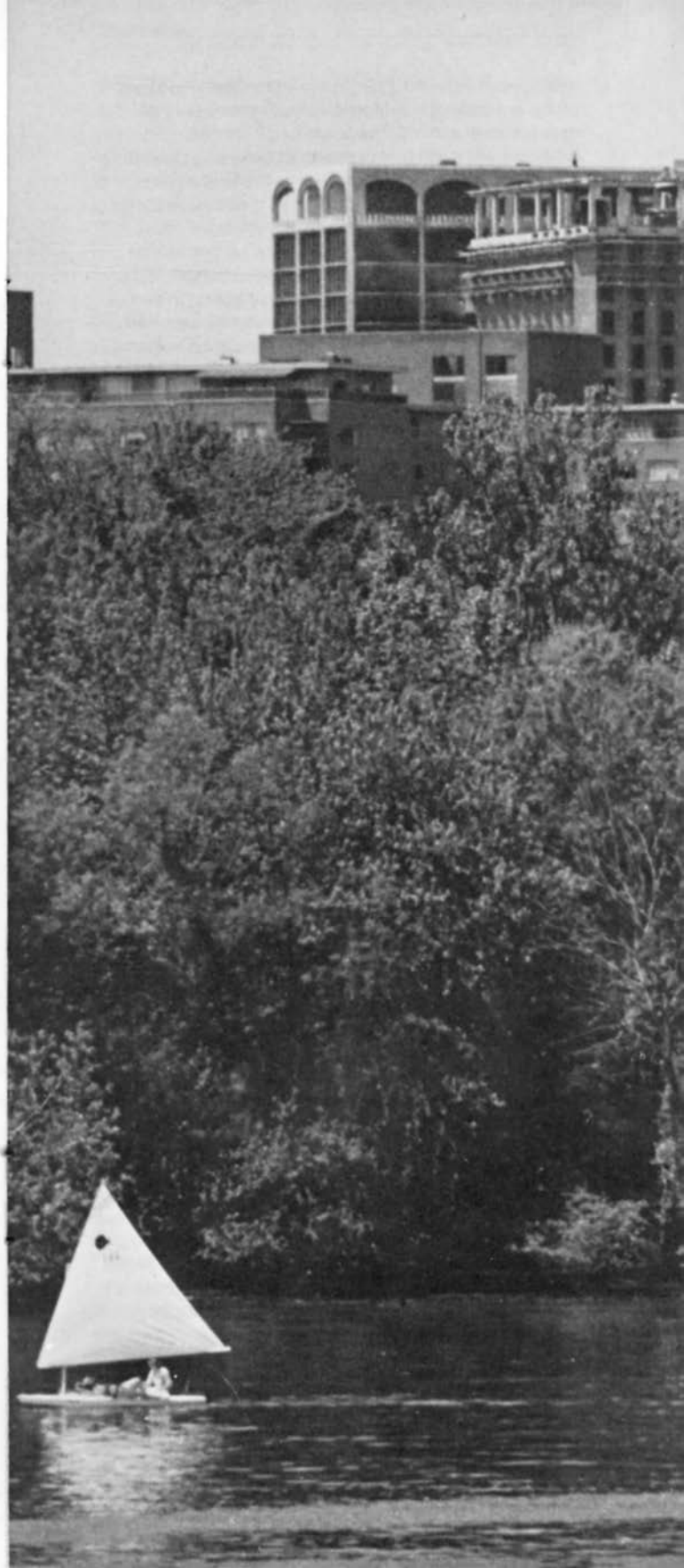


Photo by U. S. Department of the Interior

components, the cost-benefit ratio for the despoilation of the environment is in favor of a single or several individual users. In the economics of the new environment it will be necessary to have an accounting sheet with more entries than the cost of industrial water treatment, the cost of sewage disposal, and the cost of municipal water treatment. Future balance sheets will have to include the myriad complex but accountable factors of fish and wildlife, game, recreational facilities, the purchase of boats, the servicing of boats, the building of resort communities, the building of second-homes, the increased demand for consumer goods, and the products of industry that are necessary in order for our economy to grow, as well as a beautiful environment that enhances the healthful life of man.

In short, if the rivers are restored to their best biological quality, it should be possible to devise cost-benefit ratios for the use of the rivers for many purposes. Under these circumstances, the value of the living rivers as recreational areas, for wildlife production, and for hunting, fishing, swimming, and other water sports will outweigh their single purpose value as channels for industrial and municipal wastes. Clean rivers will serve the larger community and continue to serve the industrial community as transportation routes and sources of the bulk chemical, H₂O, providing that pollutants are removed before the effluent is returned to the river. The marvelous characteristic of water is that it can be reclaimed and reused and can serve all of the purposes of sustaining basic life processes and technology as well. For too long we have considered water a cheap, expendable bulk chemical that by some miracle would process and purify itself. Perhaps there was a time, when there were less pollutants and lower concentrations of biodegradable materials being pumped into the rivers, when natural processes could rectify the damage caused by man. But today, we have so altered the biota and the biological properties of the waterways that natural processes can no longer rectify man's abuses.

The river as an unexplored, undeveloped resource for city recreation is second to none in its potential, and yet we search for space in which to locate recreational facilities in the city while ignoring the most obvious. To develop city recreational facilities centered on the river is not to deny the merits of the wild scenic river. The scenic river as part of an unspoiled, untrammled, unexploited area of the countryside should be preserved and developed for its own sake. The river in the city, however, can be as great a resource of delight as any lake or other body of water that people drive hundreds of miles to admire and to use.

The concept of restoring the nation's waterways to their natural chemical, biological, and physical integrity is a desirable goal, one that will return them to public use by reestablishing a condition fit for swimming and other water sports as well as for the propagation of fish, shellfish, and wildlife.

Until this has been accomplished, the development of boats with hulls of plastic or other pollution-resistant material has made it possible to use many waterways for boating. In the 1920s and 1930s when industrial pollution was at an all-time high, it was virtually impossible to put a pleasure boat into the water without it dissolving, but today pleasure boats can be seen on many rivers and marinas are springing up along their banks.

In the western United States, particularly in desert regions, there is a different attitude toward rivers from that found among Easterners. Water is such a scarce commodity in the West that vast quantities such as Lake Mead and Lake Powell are euphoric in these very arid areas, and the irrigation waters out of the Snake River, the Gila River, the Salt River, and the Rio Grande give these rivers a special significance in the agricultural development of the region. The All-American Canal that carries water from the Colorado River to the Imperial Valley of California serves a multimillion dollar agriculture enterprise and makes the desert bloom as never before possible. This aspect of rivers and canals is quite different from the view of the river as a means of transportation, for irrigation rights make the difference between successful farming and no farming at all.

The great man-made lakes, notable Powell and Mead, probably serve the same people for recreational facilities as are served by the power generated there, but since the rivers in the east and central United States were developed with the industrial cost-benefit concept paramount, the recreational potential of these areas was largely ignored in favor of a near-exclusive use by industry.

Twenty-four cities in the United States have over one million population and almost all of them are located on rivers. San Antonio has shown the way with river and waterfront development for recreational purposes. In sharp contrast, many cities have turned their backs on the river. St. Louis, the gateway for the westward expansion, has a great arch commemorating its role in history. But as paradoxical as it may seem, this overwhelming fact could not be deduced from the St. Louis waterfront.

The Connecticut River has been relegated to a role of sewage disposal. Most of this beautiful river is undeveloped and should remain so. Where it traverses the many cities from Vermont to Long Island Sound that are in its path, it could provide recreation for millions of urban dwellers and focal points of man-nature interaction—demonstrations of man in



harmony with the environment rather than destabilizing the environment as a result of using the river as a sewer. The majestic Hudson is the epitome of river desecration on the North American continent. Recent curtailments of the absolute amount of sewage and industrial effluent, however, have given hope of recovery, and the activities of the sloop *Clearwater* have dramatized the plight of this great waterway. This magnificent replica of a river sloop from the past has given many school children the opportunity to know the thrill of moving under sail, and it symbolizes what the Hudson and other rivers can and should be: a clean river with clean water; water to drink and swim in; water that supports the life of the river and the birds and reptiles and the furbearing animals along its shores; water that forms the basis for life—all life on earth.

That a river could actually burn as the Cuyahoga did is a manifestation of the influence of technology, industrialization, and the building of cities on the waterways. Industrial man must extend his vision beyond the paramount need for machines and technology that rapaciously consume diminishing resources and must recognize that industry is an ecological flywheel capable of supplying energy and commodities while restoring the environment of the river for the use and pleasure of all people. The rivers are everywhere and so are the people, and no resource would be more easily developed for the enjoyment of urban communities than the rivers in their midst.

—Theodore W. Sudia

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Photo by U. S. Department of the Interior

Richard Nixon
President of the United States

Rogers C. B. Morton, Secretary
U. S. Department of the Interior

Ronald H. Walker, Director
National Park Service

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