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Cal R. Fremling
Winona State University

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The Impact of Man on the Ecology of the Mississippi River

Dr. Calvin R. Fremling

The Mississippi is the largest river in the United States. From its source at Lake Itasca, in Northern Minnesota, it winds 2,319 miles to its mouth in the Gulf of Mexico, 95 miles downstream from New Orleans. The Mississippi and its tributaries drain about 41% (about 1,244,000 square miles) of the total area of the United States. By definition, the segment upstream from the mouth of the Ohio River, at Cairo, Illinois, is called the Upper Mississippi River. The segment from the Gulf of Mexico to Cairo is termed the Lower Mississippi River. The river is presently navigated by 9-foot draft vessels as far upstream as Minneapolis.

To discuss the impact that man has had on the ecology of the Mississippi River, it is necessary to review, briefly, some pertinent geology and history. About 10,000 years ago, the last epicontinental glacier covered most of Minnesota, extending southward as far as Des Moines, Iowa. The southeastern corner of Minnesota and a portion of western Wisconsin, however, were left virtually unglaciated. As the glacier melted northward into Canada, it produced a large volume of melt water which could not flow northward into Hudson Bay because the glacier blocked the Red River drainage system. Glacial melt waters collected behind the ice dam to form Glacial Lake Agassiz which covered northwestern Minnesota, extreme eastern North Dakota, the southern half of Manitoba, southeastern Ontario and a narrow strip in east central Saskatchewan. Finally, when Lake Agassiz became

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overflow, a major portion of its overflow rushed down the Minnesota River Valley, to enter the Mississippi River at the present site of Fort Snelling. This southern outlet stream was named the Glacial River Warren by Upham in 1884. The flow of the River Warren was augmented by the Glacial River St. Croix, which drained Glacial Lake Duluth — the ancestor of Lake Superior. Other smaller glacial rivers, the Mississippi proper, and the Chippewa added more water to the glacial Mississippi River which cut a deep valley through limestone and sandstone strata as far south as Dubuque, Iowa. Consequently, along the southeastern border of Minnesota, the Mississippi River flows through a valley which is as much as 650 feet deep and 3 miles wide. By the time the river reaches Winona, it has dropped over half way to sea level. The elevation of the valley floor at Winona is only 550 feet above sea level, but precipitous bluffs tower 650 feet above the city. The topography of the terrain in southeastern Minnesota is very rugged because of dendritic drainage patterns cut by tributary streams which flow rapidly downward toward the Mississippi River. The beautiful, orange Jordan sandstone stratum which outcrops beneath the Oneota dolomite in southeastern Minnesota dips gradually downward to form the artesian aquifer which is tapped by so many wells in the suburban Minneapolis and St. Paul area.

One hundred and forty seven years ago, in 1823, the first steamboat probed its way up the Mississippi River as far as the present site of St. Paul. The next year, government-owned and operated boats began to improve the river navigation by removing snags, boulders and other obstructions. In 1829, Captain Henry Scribe was commissioned to construct and operate a special twin-hulled snag boat on the upper river. It was important to the growth of our young nation that the river be improved to provide a water highway to the sea because the interior of the continent was relatively inaccessible to overland freight haulers. Early channel improvements, however modest, enabled the United States to quickly exploit the interior of the entire North American continent. By the 1870's hundreds of shallow-draft steamboats routinely navigated the Upper Mississippi River.

Loggers used the river, too. By means of the Chippewa, the Black, the Wisconsin and smaller Wisconsin rivers, they quickly exploited the pineries of northwest Wisconsin, floating huge rafts of saw logs down to the Mississippi and then down to the sawmills of Winona, La Crosse, Clinton and Rock Island. At one time there were over 80 sawmills on the upper river and at least 120 more on tributary streams.

The early log and lumber rafts drifted down the river, guided by men with oars at the bow of each raft. Later, steamboats pushed the rafts down the river. Toward the end of the logging era, in 1912, one boat often went down the river sideways at the bow of the raft while one pushed at the stern. By signalling the bowboat to go forward or backward, the captain at the stern of the raft was able to negotiate the hairpin turns of the Mississippi River. The largest rafts were 1,430 feet long and 285 feet wide, and they contained over 9,000,000 board feet of lumber — the equivalent load of 900 railroad cars.

In 1878, the U. S. Army Corps of Engineers was authorized by a Congressional Appropriation Act to deepen the navigable channel of the Mississippi River to four and one-half feet so that larger boats with deeper draft could operate on the river. This was done by constructing rock closing dams on the side channels so that water which ordinarily went down side chutes was conducted into the river proper. Obstructive rapids were by-passed by constructing short lateral canals which contained navigation locks. Hundreds of rock and brush structures called wing dams were also constructed. The wing dams, often at intervals of about $\frac{1}{4}$ mile, extended outward like rock piers from the shore, at right angles to the main channel of the river. They diverted the river into a single narrow channel, during low flow, so that the river scoured its channel deeper. Troublesome sandbars were removed by a dipper-type dredge. By 1905, the four and one-half foot channel was a reality between St. Louis and the Washington Avenue Bridge at Minneapolis.

Meanwhile, larger, more powerful riverboats had evolved and they needed a deeper channel to carry greater pay loads. Additional funds were appropriated by Congress in 1907 to deepen the navigable channel to 6 feet. This was accomplished by building additional wing dams, closing dams, and by dredging. Usually, on the opposite side of the river from the wing dams, the shore was fortified with rock so that water which rushed around the ends of the wing dams did not erode away the opposite shore. Thus, the extreme channelization begun in 1878 was finally completed in 1912. As one flies along the Upper Mississippi River, he can still see old rock quarries atop most riverside bluffs where limestone was quarried and sent down to waiting barges which transported the rock to wing dam construction sites.

The short-lived logging boom which began in 1875 hit its peak in 1892; and in 1915 the Ottumwa Belle snaked the remnants of Wisconsin lumber down the Mississippi River. Six-foot draft steamers also

began to disappear from the upper river because they could not compete with the railroads. In 1890, for example, 5,417 steamers, 1,045 barges and 2,123 rafts passed Winona. By 1930, total river traffic at Winona had been reduced to 215 steamers, 347 barges and no rafts. It was apparent that river commerce would be doomed unless further channel modifications were made.

The Rivers and Harbors Act of 1930 authorized the Corps of Engineers to modify the obsolete 6-foot channel to provide a minimum depth of 9 feet and a minimum width of 400 feet. This was achieved by the construction of a system of locks and dams, supplemented by dredging. Most of the resultant 29 locks and dams were constructed during the 1930's. A notable exception is Lock and Dam 19 at Keokuk, Iowa, which was constructed as part of a hydroelectric facility in 1914. The navigation locks are operated and maintained by the Corps of Engineers, but the U. S. Coast Guard is responsible for the maintenance of the elaborate system of navigation aids which guide modern towboats as they navigate the river around the clock from early spring until early winter.

Modern towboats are a far cry from the old sidewheelers and stern-wheelers of yore. The present day towboat pushes as many as 15 barges, a fifteen-barge tow carrying the equivalent load of a 100-car freight train. The modern towboat is equipped with radar and sonar and it may utilize as much horsepower as a destroyer as it pushes a fifth of a mile of barges up the river. The riverboat, once almost doomed by the railroads, now provides fierce competition for transporters of bulk commodities such as coal, oil, gasoline, grain, molasses, and anhydrous ammonia.

The southern most dam on the Mississippi River is the newly constructed Chain of Rocks facility at St. Louis. Downstream 185 miles from St. Louis, the Ohio River enters the Mississippi at Cairo, Illinois. Here, the Lower Mississippi begins a 954-mile path through its own immense, flat, alluvial delta to the Gulf of Mexico. The lower river, at one time, constantly changed its course as it meandered about its flood plain. During the past two hundred years, however, the entire lower river has been channelized with earthen dikes to prevent flooding of the fertile delta through which the river flows. Furthermore, the Army Corps of Engineers has insured the channelization of most of the lower river by amoring its banks with rock to prevent the river from changing its course. The river has also been shotrened by cutting off

many meanders. Because there are no dams on the Lower Mississippi River, it is in essence a deep, narrow (200 feet deep, one-half mile wide at New Orleans), sinous ditch which conducts most of the effluents of the United States very rapidly (average flow 611,000 cubic feet per second) to the Gulf of Mexico.

The huge navigation dams of the Upper Mississippi have transformed the old free-flowing river into a series of impoundments which occupy most of the flood plain of the river. Consequently, the river is much wider in southeastern Minnesota than it is at New Orleans. Each impoundment consists of three distinct ecological areas. The tailwater areas just downstream from the dams show the river in relatively unmodified form. The areas are typified by deep sloughs and wooded islands. The middle portions of the pools are principally flooded hay meadows. They now provide the best marsh habitat. The downstream ends of the pools are deeper, however. They consist mainly of open water and their bottoms are heavily silted. Marsh vegetation is presently creeping downstream as the pools silt in. Marsh vegetation in the middle pool areas is being replaced, in turn, by trees and other terrestrial vegetation.

The old wing dams and closing dams, still partially functional, now lie propellor-deep beneath the water (most motor boat operators have learned that one way or another). The wing dams now provide rocky corrugations on the river floor, so that they, in effect, have increased the total surface area of the river bottom—thus increasing its carrying capacity for invertebrates such as hydropsychid caddisflies and periphyton. Impoundment has also increased the surface area of the river, thereby increasing the area where photosynthesis can take place.

The seven-county area which contains metropolitan Minneapolis and St. Paul contains about 1/3 of Minnesota's population and the population in the seven-county area is expected to double in the next 30 years. The people of the seven-county area exert a profound influence on the Mississippi River. The profusion of sewage treatment plants in the area pours large volumes of noxious effluent into the river daily. Even a huge, modern, well-run plant like the Minneapolis-St. Paul Sanitary Sewer District facility at Pig's Eye Island cannot effectively cope with the sewage of 2.5 million people (or their equivalent). Even with primary and secondary treatment the plant only accomplishes about 80% reduction of putrescible waste. Eighty percent reduction in the biochemical oxygen demand of the sewage sounds good, but if

stated another way it does not sound so good. The untreated 20 percent which runs into the river is roughly equivalent to 500,000 people dumping their chamber pots into the river each day. In addition to partially treated organic matter and other oxygen-hungry compounds, the metropolitan sewers pour insecticides, herbicides, nutrient elements such as nitrogen, phosphorous and potassium, hard detergents, and sundry other toxicants into the river. As a consequence, the river from St. Paul to Hastings is an open sewer. The river there bubbles constantly as methane and hydrogen sulfide rise to the surface. The gases are the result of anaerobic decomposition of putrescible materials. Few fish, with the exception of carp, live between St. Paul and Hastings.

Smaller cities, of course, also add partially treated sewage to the river. The contributions of smaller downstream cities have less effect on the river, however, because they are small and the river is so large. Effluent is also added by farmers and suburbanites who have their own sewage treatment facilities. It goes without saying that tributary streams are often fouled by overflow from poorly designed, over-taxed dry wells and drainage fields. Also, nutrients and hard detergents probably enter the river via the water table after they have soaked into the ground. Cattle, pigs, turkeys, chickens and other livestock add large amounts of nutrients and organic matter to the river. There are undoubtedly several times as many tons of livestock in Minnesota as there are tons of people. They must, therefore, produce much more excrement than the people do. One cow, for example, produces about as much excrement as 11 people. Usually, the excrement of livestock is left untreated on the surface of the ground where it can wash easily into the nearest creek.

Navigation dams on the Upper Mississippi were meant for navigation but they have proven to be very good sewage treatment facilities. The dam at Hastings, for example, creates a huge sewage lagoon below St. Paul. After the sewage receives primary and secondary treatment in the sewage treatment plants of the metropolitan area, it is lagooned by the Hastings dam. Here, decomposition of some of its pollutant load occurs. Then the sewage goes through the roller gates of the dam and is aerated somewhat. Continuing downstream, it is impounded behind each succeeding dam so that it receives additional sewage treatment as it proceeds down the river. The Mississippi River is also diluted by the cleaner waters of rivers such as the St. Croix and the Chippewa.

Beautiful Lake Pepin, sadly, serves as a collection basin for nutrients, bacteria and sludge from the metropolitan area. The nutrients (nitrogen, phosphorous and potassium) are incorporated in plankton or fish which, upon their death, settle to the bottom of the Lake Pepin. The nutrients, of course, may be recycled and proceed downstream again, but by the time the river reaches the lower end of Lake Pepin, it is marginally safe bacteriologically for water contact sports. Many people use the river for swimming from the lower end of Lake Pepin as far south as Clinton, Iowa.

Algae proliferate in the Upper Mississippi River because of the nutrients poured in upstream. The algae, in turn, provide the basis for most food chains in the river. In a lake, the algae could be deadly because dead and respiring algae could rob the lake of its dissolved oxygen, especially when the lake is thermally stratified in the summer or ice-covered in the winter. The Mississippi River and other big rivers, due to the fact they are turbulent, are usually well-oxygenated. Such rivers can assimilate a great load of high BOD pollutants.

As a result of broadening the river and increasing its surface area, corrugating it, and supplying nutrients to it, we probably have more pounds of fish per linear mile in the Mississippi River now below Lake Pepin than we had when the white man arrived. The river probably contains in excess of 300 pounds of fish per acre. Most fisheries biologists consider this to be a very conservative estimate. When compared with the productivity of a lake trout lake in northern Minnesota, which may produce only 20 pounds of fish per acre, the Mississippi River is a very productive fishery. Because the river is so productive, fishermen are able to fish year round, with two lines, for sunfish, crappies, walleyes, northern pike and many other species of fish. So varied is the fish fauna of the river, that it is not unusual to catch 10 or more species of fish in one day. In addition to the fishes found elsewhere in the state, the river also contains unusual forms such as the paddlefish, gar, spotted sucher, eel and sturgeon. The river from Red Wing to St. Louis is extensively fished by commercial fishermen who may use trot lines, seines, gill nest or hoop nets depending upon state regulations. A single seine haul often yields over 100,000 pounds of fish. We have even introduced more efficient fish. The carp, for example, was imported in the late 1800's because it was such a highly esteemed fish in Europe and Asia. The carp is an omnivorous fish. Because it eats low in the food chain, the carp is an extremely efficient producer of fish flesh.

Commercial fishermen are not permitted to keep game fish, but they are permitted to keep carp, buffalofish, sheephead, suchers, catfish and other "rough" fish. Although some of the fish are sold locally, most are sent to eastern markets. The salt water fishermen there, in turn, change the name of second rate fish such as the rose fish to ocean perch and sell it in our local markets. We have, in effect, established a reciprocal trash fish trading policy.

Man has also influenced the abundance of other life forms in the Mississippi River. Sediment from eroded farm land and organic matter from upstream pollution sources has collected without the impoundments and within Lake Pepin to such a degree that sand-inhabiting clam populations have been decimated. Side channels with sand bottoms and fair currents were once prime clamming areas. Thousands of tons of clams were taken from such areas for the pearl button industry. Many of the channels, however, have been intercepted by roads, dikes and railroads so that they stagnate during the summer. The stagnated sloughs stratify thermally in the summer so that the upper warm water and the cooler lower water do not mix. The rich organic ooze which settles to the bottom in the sloughs consumes the dissolved oxygen from the lower stratum until the lower zone becomes a death zone. Most forms of life, clams included, fail to live in such areas.

Some life forms, however, have flourished in the silted navigation pools. The burrowing mayfly *Hexagenia*, for example, does well in most silted impoundments as long as there is sufficient current to supply oxygen-rich water. Mayflies are primitive insects which belong to the order Ephemeroptera. The adults, which have vestigial mouth parts, usually mate and die within 30 hours after they emerge from the water in which they have lived as aquatic nymphs. The genera *Hexagenia* and *Pentagenia* are of special interest to vacationers, towboat captains, motorists, and others who spend much time along the river's edge.

People who live along most of the Upper Mississippi River are accustomed to periodic invasions by hordes of mayflies. Tree limbs droop under their weight, and drifts of the insects form under street lights where they decay and create objectionable odors. Shoppers desert downtown areas as the large, clumsy insects fly in their faces, cover windows, and blanket sidewalks. In extreme cases snowplows are called out to reopen highway bridges which have become impassable. Mayflies become a hazard to navigation when they are at-

tracted by the powerful arc and mercury-vapor searchlights used by towboats to spot unlighted channel markers.

Perhaps a true-life incident will illustrate the virtually incomprehensible numbers of mayflies which exist in prime Mississippi River habitat. On July 8, 1966, my students and I drove to a little-used bridge which spans a side channel of the Mississippi River at Winona. Our purpose was to collect large numbers of mayfly eggs for laboratory experiments. A tub of water was placed beneath the car lights, and mayflies which were attracted fell into the water, where they released their eggs. As the layer of insects became too thick on the water's surface, the spent insects were scooped away by hand to make room for more. In less than two hours, about 345,000,000 eggs were thus collected.

Female mayflies comprised all of those collected. They passed in steady flight over the bridge, 50 feet above the river surface, flying upstream. Those that passed through the beam of the headlights flew erratically toward and milled around the beam. As they landed on the bridge or on the car, they were quickly buried beneath other incoming insects. With each light gust of wind, high-flying insects suddenly descended to a lower level, thus increasing temporarily the hordes of insects in the area of the headlight beam.

The pile of insects was so deep by 12:20 A.M. that they began to cover the headlights of the car. The height of the pile tapered off with increasing distance from the lights, but it was still an inch deep 30 feet away. The insects were still flying in undiminished numbers when the car was shoveled free of the wet, greasy mass at 12:35 A.M.

During the observation, the annual celebration "Steamboat Days" had been in progress at Levee Park along the Winona waterfront. The brightly-lighted carnival area attracted many insects and by 11:00 P.M. the insects were over 6 inches deep on the floor of the carousel. The carnival was shut down completely after mayflies clogged the radiators of the diesel-powered generators at 11:45 P.M. causing them to overheat.

The impoundment and attendant siltation caused by the 9-foot channel project have increased burrowing mayfly populations on the less polluted portions of the Upper Mississippi River. Pollutants, however, have virtually eliminated burrowing mayflies between St. Paul and Hastings and for over 300 miles below St. Louis. Burrowing mayfly populations have been severely reduced in Lake Pepin, also.

Chironomid midges, which are tolerant of low oxygen levels, have replaced mayflies in much of the lake.

Burrowing mayflies are excellent indicators of general water quality because their life cycles are relatively long. Their presence in an area surely does not indicate that the water is safe to drink or even to swim in. Their presence does mean, however, that the body of water in question retains high oxygen levels and that it is not poisoned by pollutants. Unlike chemical tests which describe pollutant levels only at the time when the tests were taken, mayfly distribution indicates what water conditions have been like for a prolonged period. Also, while chemical tests only test for specific pollutants, mayfly distribution indicates the subtle, synergistic effects of combinations of many pollutants

It is difficult to conceive that burrowing mayflies, which exist in numbers sufficient to block bridges, may be endangered species. Nevertheless, I can foresee the demise of burrowing mayflies if we do not stop the pollution of our rivers and the rapid autrophication of our lakes. But, who cares if the mayflies are eliminated? Are they really ecologically important? I think that they are very important. Mayfly nymphs are probably the most important single food source for most Mississippi River fishes. This is also true in many Minnesota lakes. Because the nymphs grow slowly for as long as a year, they are available in sizes to suit all-sized fish at all times of the year. Moreover, mayfly nymphs consume algae, detritus and bacteria as their principle food sources. Therefore, they are excellent converters of organic sediments to high quality fish food. The most efficient food chains in nature are short chains. The algae-mayfly-fish food chain is extremely efficient.

In addition to polluting our rivers chemically and aesthetically, we are also polluting them thermally. We already have enough heated water in the Mississippi in the metropolitan area from showers, bathtubs, washers and industry so that the river seldom freezes from St. Paul to Red Wing. Perhaps this explains partially why the walleyes usually bite a week or two earlier in the spring at Red Wing than they do at La Crosse. It is due in part, of course, to the fact that the massive Lake Pepin ice sheet prevents the river downstream from warming faster.

The warming of the river in the metropolitan area is probably a blessing to those of us who live downstream because the warming

hastens the decomposition of the metropolitan pollutant load. I wonder, at times, why nuclear power plants cannot be built in tandem with sewage disposal plants so that thermal effluent can be utilized to hasten the chemical and bacteriological reduction of wastes which have high bio-chemical oxygen demands.

Of all the pollutants which enter the Mississippi, the most insidious are sand and silt. Sometimes we forget that the beautiful sand beaches which we enjoy along the river below Lake Pepin are man-made beaches. The sand has been placed there by the Corps of Engineers which dredges the channel constantly to maintain its 9-foot depth. The sand washes into the river from tributary streams such as the Chippewa, Zumbro and Whitewater which flow through sandstone areas. The St. Croix, which flows through igneous rock formations, contributes little sand.

The Chippewa River is typical of the tributaries which have become sand-choked during the whiteman's brief tenure in North America. The Chippewa was described in 1805 by Zebulon Pike who said, "This river is at least half a mile wide, and appears a deep and majestic stream; it bears from the Mississippi nearly due north. Some distance up it is scarcely to be distinguished from the Ouisconsin (Wisconsin)." Even at extremely low flow in August of 1863, the Chippewa still floated rafts which were 10 inches deep. The Chippewa was serviced by 2½ foot draft stream boats as far as Durand, Wisconsin, until 1912. The Chippewa is now so laden with sand that it is a challenge to canoeists during low water. The Chippewa disgorges its sand load into the Mississippi at the foot of Lake Pepin.

Other tributaries of the Mississippi have also become sand-choked. Streamers once ran up the Des Moines River to the city of Des Moines, up the Iowa to Iowa City, and up the Wisconsin as far as Wausau. Shallow draft vessels even ran regularly on the Maquoketa, the Black and the Rock. Streamers plied the Mississippi above St. Anthony Falls as far north as Bemidji.

Man's land use patterns in the Mississippi River watersheds have greatly accelerated the relentless erosion of the land. As a result, the navigation pools are filling rapidly with sand. Soil from abused hillsides adds to the sediment problem as does organic ooze caused by upstream enrichment of the river by pollutants. Virtually every tributary valley of the Mississippi has a delta at its mouth-mute evidence of soil and sand lost to the river. Surely, erosion of the bluffs

and the consequent raising of the river bed are natural, predictable geological phenomena. Man, however, by his activities in the watershed, is rapidly accelerating the elevation of the flood plain.

Extreme fluctuations in river level have been observed for many years on the Mississippi River. Zero points with which to compare subsequent river stages were established during low water in 1864. In the spring of 1880, at Winona, the flood crest rose 16 feet, 8 inches above the zero point. During the severe drought of 1932, however, the river level fell 42 inches below the zero reference level. The impoundment created by Lock and Dam 6 raised the water level at Winona such that "normal" river level is now 5.25 feet. During the spring floods of 1965 and 1969 the river rose to levels in excess of 21 feet — 16 feet over the new norm of 5.25 feet.

It is possible that the elevation of the flood plain is partially responsible for the increase in the height of flood crests in recent years? Research at Winona State College reveals that many areas of Pool 6 have filled in several feet in the last 30 years. It seems an inescapable conclusion to me that if the navigation pools fill with sand and silt, the 5-foot rise of the river bottom must be attended by a commensurate rise in flood crests.

Two other factors probably also contribute to rising flood crests. Highway and urban construction are waterproofing the watershed with asphalt, concrete and other hard surfaces so that spring runoff is more rapid. Over one and one-half percent of the Mississippi River watershed has already been so waterproofed. Wetland drainage and tiling also hasten spring runoff.

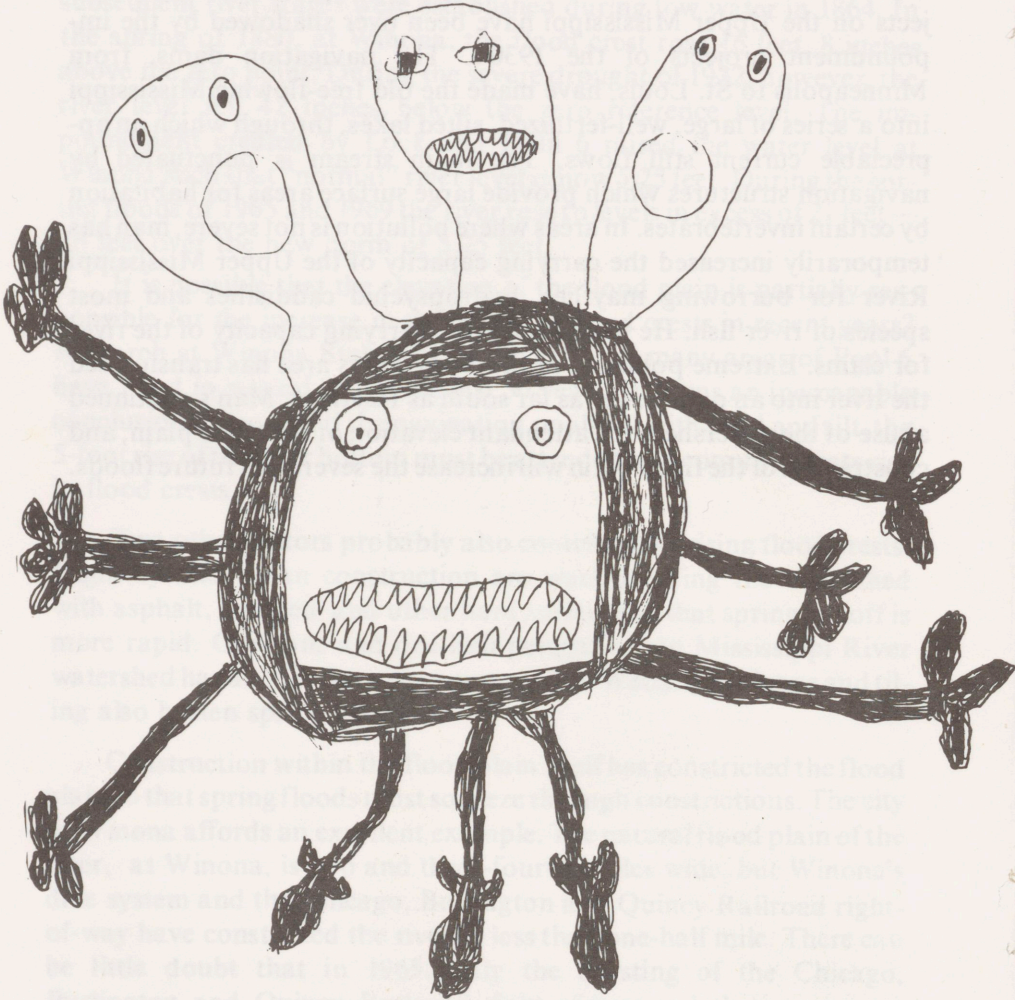
Construction within the flood plain itself has constricted the flood plain so that spring floods must squeeze through constrictions. The city of Winona affords an excellent example. The natural flood plain of the river, at Winona, is two and three-fourths miles wide, but Winona's dike system and the Chicago, Burlington and Quincy Railroad right-of-way have constricted the river to less than one-half mile. There can be little doubt that in 1965, only the bursting of the Chicago, Burlington and Quincy Railroad right-of-way and the consequent flooding of Wisconsin bottom land prevented Winona's dike system from failing.

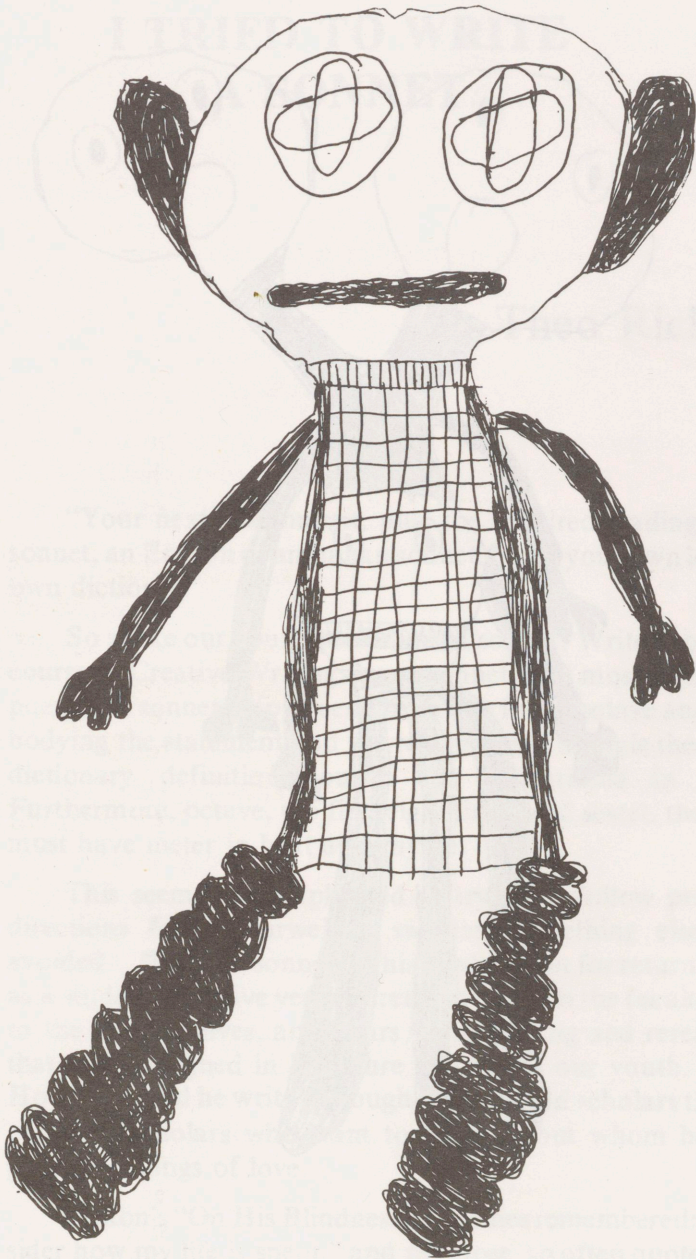
To be sure, severe spring floods are caused mainly by factors such as heavy snow cover on frozen ground, a late spring, heavy rains during the spring thaw, and synchronous thaws in the Mississippi, Minnesota,

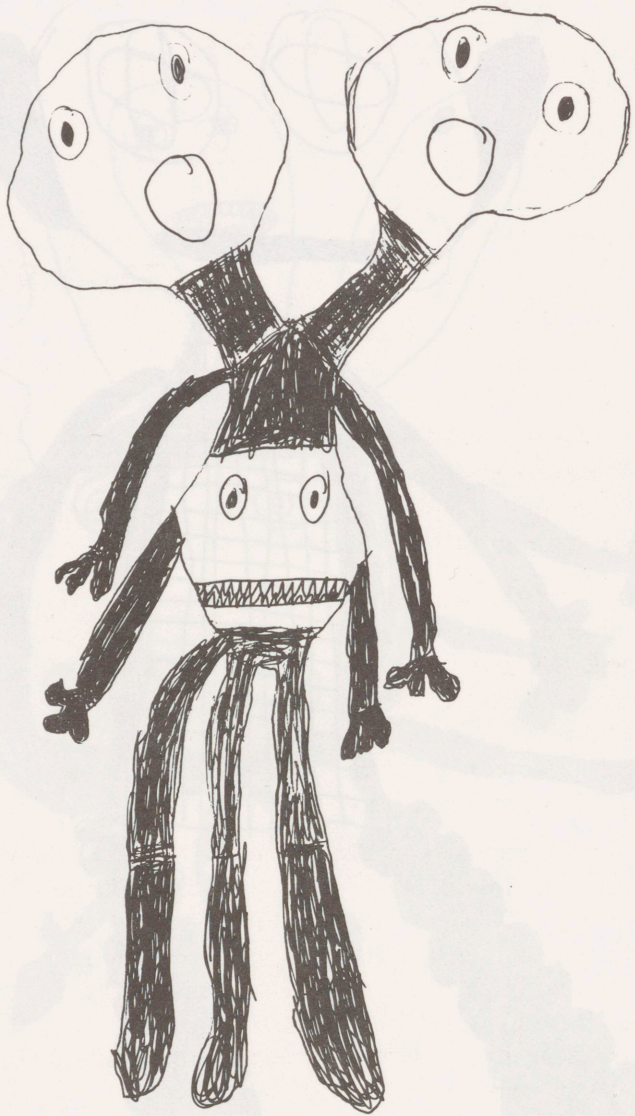
St. Croix and Chippewa River watersheds. The man-made factors, however, may have helped in 1965 and 1969 to cause two "hundred-year" floods in five years.

In summary, the meandering Mississippi of yesteryear has been transformed by man into a narrow, channelized, polluted, sinuous ditch from St. Louis to the Gulf of Mexico. Early channelization projects on the Upper Mississippi have been overshadowed by the impoundment projects of the 1930's. The navigation dams, from Minneapolis to St. Louis, have made the old free-flowing Mississippi into a series of large, well-fertilized, silted lakes, through which an appreciable current still flows. The main stream is punctuated by navigation structures which provide large surface areas for habitation by certain invertebrates. In areas where pollution is not severe, man has temporarily increased the carrying capacity of the Upper Mississippi River for burrowing mayflies, hydropsychid caddisflies and most species of river fish. He has lowered the carrying capacity of the river for clams. Extreme pollution in the Twin Cities area has transformed the river into an open sewer as far south as Hastings. Man's continued abuse of the watershed, the attendant elevation of the flood plain, and constriction of the flood plain will increase the severity of future floods.

DOG DAYS







I TRIED TO WRITE A SONNET

Theo Richter

“Your next assignment, plus the required reading, is to write a sonnet, an English or an Italian sonnet, but in your own language, your own diction.”

So spake our young professor. A sonnet? Write a sonnet? This is a course in Creative Writing, but a sonnet, that most rigidly patterned poem? “A sonnet, a fourteen line poetic form: octave and sestet. . . embodying the statement and the resolution of a single theme.” The very dictionary definition sounds like a formula in mathematics. Furthermore, octave, the first eight lines, and sestet, the last six lines, must have meter in beat and rhyme.

This seems as complicated as trying to follow printed knitting directions for a Norwegian sweater, something else I’ve always avoided. . . “Write a sonnet.” This is what I get for returning to campus as a student after five years of retirement from the faculty. . . So, home to the book shelves, and hours spent reading and rereading sonnets that were assigned in literature courses of our youth. Shakespeare. How many did he write? Enough to confound scholars these hundreds of years, scholars who want to know about whom he wrote these patterned songs of love.

Milton’s “On His Blindness” and lines remembered: “When I consider how my life is spent,” and the close, so often quoted: “They also serve who only stand and wait.” Robert Frost’s “Mowing.” It is the

only sonnet by Frost I could ever find. Lizette Woodworth Reese about "Tears." "When I consider life and its few years, I wonder at the idleness of tears."

A hunt through volumes of verse and bulky collections of literature revealed relatively few sonnets. So even the famous poets avoided this ironbound form, thought I. Subjects: love, desolation, heartache. Not for me. . . .

For the next ten days the word **sonnet** was at the top of my consciousness. It was thought of hourly, it seemed, while doing household tasks, going to market. Would the vegetable bins give one a clue as to what to write about? Carrots and cabbages. A fragment long forgotten came to the fringes of my mind: "cabbages and kings." Nursery rhyme? No time to trace it now. Marketing for vegetables? Yea, even so, said I as I selected tomatoes and later stirred the soup.

"Write in your own language," he said. . . Our language comes not only from our daily speech, our education, our reading, but from our experiences, too, and our tasks. Language! Language was a separate subject in grade school, as history was, and geography, reading, spelling, arithmetic, penmanship. Language class, where one became aware for the first time of the beauty and precision of words, of sentences, paragraphs, thoughts, stories. We learned the acceptable words, and we shied away from the forbidden ones. Forbidden words that today are used commonly but still shock. Why would anyone, I mused, not of the gutter want to use gutter words?

Language! Our own beautiful language, and a line read about it and never forgotten: "While the iron of English rings on the human tongue." The iron of English? Yes, its thunder and lightening, too, its sun and song, its softly falling rain, its moonlight and its nights of stars. . . Oral English, too. Dialects: English enriched, flavored, overlaid with the speech of other lands. The lilting cadence of the Irish; soft musical Italian; French, nasal and. . . nasal; The harsh German; comedic Pennsylvania Dutch; Scotch, burred and blunt; New England Yankee, twangy, practical, terse, even to the slurred eye-ay; Staccato rapid Spanish. American: Southern, Northern, Western, Eastern pronunciation, changing almost from state to state and from section to section of the same state.

I remember an Englishman saying to me, "Madame, you speak as the English do." Answering, I said, "I speak our language as I was born and bred to speak it, as a middle-westerner in the United States. Ours is

not the most beautiful speech in our country, but it is the clearest. It is our language."

"Write in your own language." Ah, yes.

But a scholarly interest in Language and English speech is not an opening gate to sonnet writing. What to write about? What? Where is a subject for a sonnet? Love, of course, but my love has been tempered with time and has no thematic problems to be placed in octave and resolved in sestet . . . The problem of war has disturbed for years . . . So . . . keep hunting for a subject.

How about a visit to the dentist? Could that be sonnetized? Sonnetized? **What am I doing?** To use a beautiful word in this way is to hang it with dross. Can a sonnet ever be humorous? I've never found one that was. Perhaps a humorous sonnet would slide dangerously toward limerick or doggeral. My gallant young classmate, Bill Kerins, thinks the limerick is bastardized rhyme at its worst. "I HATE limericks," he says, with quiet vehemence.

Came a sleepless night, thinking about many things. Ideas evolved in the quiet, even chapter titles for an unnamed book. But a subject for a sonnet? The very darkness laughed. Pad and pencil were carried in purse, in case inspiration were to strike. It never did.

Read Elizabeth Barret Browning again: love songs to her husband, for her husband. And for publication, of course. And why are they called "Sonnets to the Portuguese?" No one seems to know. I told my classmates I'd even been to Portugal and none there knew. Or would hazard a guess. Could the fact be that the Brownings lived in Portugal for a time? So suggests my friend Mary Hebbard.

I read about Jorge Louis Borges of Argentina who became blind in 1955, and who now says, "And that's why I have fallen back on classical forms of verse. I find that sonnets, for example, are very portable. You can walk all over a city and carry a sonnet inside your head, while you can hardly do that with a free verse."

I can, Senor Borges. I can!

The trouble is, I cannot be confined to the chained pattern of a sonnet. I feel "cabined and cribbed." Our good professor, one suspects, wanted us to realize that it is not easy to be a poet. And it is not, assuredly. Did I meet the assignment? Oh, yes. It took hours of perspiring effort to cramp into fourteen lines the tragedy of our twentieth century

of wars, octave, and hope for recovery, sestet. I titled it "Losses." Then I tried a second one about a dreaming child cloud-watching on a summer day, and wanting to fly through cumulous clouds. The sestet: doing so in an aircraft years later and being buffeted in the deceiving soft-look whiteness. Rough air in those clouds. I titled this one "Realization."

And the professor? He returned my papers without a grade or comment. They were that bad. I knew they were. Well, I tried. I tried to write a sonnet.