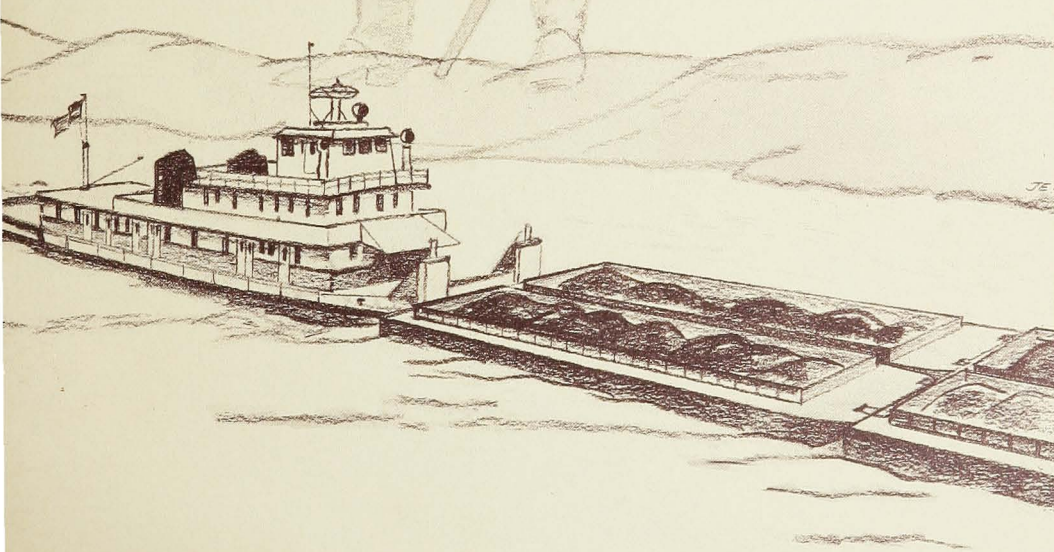
A CENTURY OF SERVICE

The Centennial Story of the St. Paul District, Army Corps of Engineers



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THE CENTENNIAL STORY
OF THE
ST. PAUL DISTRICT, ARMY CORPS OF ENGINEERS

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DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, ARMY CORPS OF ENGINEERS
1217 U.S. Post Office and Custom House
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INTRODUCTION

This centennial story of the St. Paul District, U.S. Army Corps of Engineers has been prepared with two specific goals — a brief summation of the St. Paul District's varied activities during the past 100 years, and the focusing of attention on the Corps' program in developing our water resources.

General G. K. Warren coming into the upper midwestern United States 100 years ago, brought with him a proud heritage of an organization established 9 decades before by General George Washington. Washington, just prior to the Battle of Bunker Hill, on 16 June 1775 to be exact, appointed Richard Gridley as Chief Engineer of the Colonial Army. This is recognized as the inception of the present Army Corps of Engineers, an organization which has established an enviable professional reputation and has continued to this day as the principal engineering agency for the federal development of our nation's water resources. This story tells how the St. Paul District has contributed to the Corps' reputation.

This story is necessarily brief. On the other hand, the varied activities of the St. Paul District, discussed in each of the following sections, are worthy of a far more expanded and detailed description than presented here. A volume of several hundred pages would be required to do justice to these activities. Appendix 1 contains a selected bibliography for those interested in a wider view of life in the area encompassed by the St. Paul District during the past century.

Many people have contributed to the preparation of this story through their encouragement and suggestions. Mr. Donald Ludwig, Chief, Real Estate Division and Mr. Roger Hooper, Chief, Program Development Branch, reviewed the manuscript and offered many constructive criticisms. Mr. John W. Larson, Chief, Technical Liaison Office, was particularly helpful in his suggestions on format and emphasis. Miss Jean Thurmer designed the cover of this publication and the art work included in the text. Those who contributed most to this story, however, are those who made it possible — the present and former civilian and military employees whose service contributed to the success of the St. Paul District's mission. To all of these, this story is dedicated.

St. Paul, Minnesota
20 May 1966

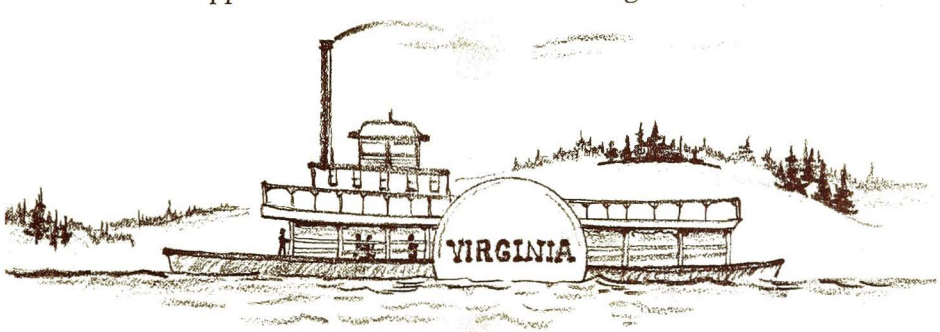
Brevet Major General Gouveneur Kemble Warren, First District Engineer at St. Paul, 1866-1870. A native of New York, West Point graduate and Civil War veteran.

IN THE BEGINNING

THE Corps of Engineers St. Paul District had its inception on 31 July 1866 when Major General Gouveneur Kemble Warren was assigned as the first District Engineer. Establishment of the St. Paul District at that time was particularly significant and opportune. The Civil War had been concluded only a short time before, and during the period of reconstruction which followed, a flood of homesteaders pushed into the Mississippi River Valley and the prairie country beyond. The inland waterways of the country were the natural routes of travel for these homesteaders moving from the more settled eastern part of the United States into the west.

From 1823 when the first small steamboat the "Virginia" came up as far as Fort Snelling, stern-wheeled wood-burning packet boats operated in the upper Mississippi River Basin, primarily on the Father of Waters itself, but also on the St. Croix and Minnesota Rivers. Regular traffic had developed by the 1840's bringing soldiers, sightseers and settlers into the upper midwest and providing them with a means to communicate with older established areas of the south and east. These boats also carried as cargo the goods which helped to support and enliven life in the river communities which grew up on the edges of a still wild and undeveloped country. Thus, these incomparable systems of waterways made possible the initial development of the upper midwest, and provided an easy route for the horde of settlers pushing into the west at the time of General Warren's arrival at St. Paul.

General Warren was well qualified for the post to which he was appointed in July 1866. Gouveneur Kemble Warren's career followed a pattern typical of many Army Engineer officers of the period. A native of New York, Warren graduated at the age of 20 from the United States Military Academy in 1850 as a Brevet Second Lieutenant in the Corps of Engineers. Academic life at West Point in those days, as it is now, followed the traditional curriculum in military tactics and engineering combat techniques as well as training in basic sciences and civil



engineering essential to the Corps civilian activities in planning, construction and maintenance of flood control and navigation projects on waterways of the United States. The youthful Warren apparently learned his lessons well as evidenced by his being second high man in his class.

Lieutenant Warren's initial assignment was on a project for stabilizing the navigation channel on the middle reaches of the Mississippi. Then five years of mapping and exploring in the Dakota and Nebraska territories were followed by a year of teaching mathematics at the Academy at West Point. From 1861 to 1865 during the Civil War he distinguished himself in the Union Army, putting to use the theoretical knowledge and practical experience he had gained at the Academy and on the job in the West.

General Warren's arrival in St. Paul in July 1866, coincided with the beginning of railroad expansion into the West which would become increasingly important with each passing decade. Significantly, only a few weeks earlier on 23 June 1866, Congress had passed a River and Harbors Act sponsored by the United States Senate Committee on Post Offices and Post Roads of which Minnesota's Senator, Alexander Ramsey was chairman. The Act authorized General Warren to study potential sites for railroad bridge construction across the Mississippi between St. Paul and St. Louis. Alexander Ramsey while serving in the Senate provided valuable assistance to General Warren in carrying out this study which eventually was documented in a detailed and voluminous report.

During his tenure as District Engineer, General Warren was assigned several critical tasks. In 1869 the Falls of St. Anthony on the Mississippi River in Minneapolis were threatened with obliteration by the collapse of the Eastman tunnel; immediate attention and drastic action were required for the preservation of the falls as a primary source of water power for local industries. Improvement for navigation of the Mississippi, the St. Croix and the Minnesota Rivers and the Red River of the North was a continuing project; the development of plans for a series of headwaters reservoirs near the source of the Mississippi was considered necessary to aid downstream navigation. These projects continued through the administration of General Warren's three immediate successors — Colonel Macomb, Major Farquhar, and Major Allen.

During the past century, 38 District Engineers have followed General Warren. All of these except one have been officers in the Army Corps of Engineers, and a majority were graduates of the U.S. Military Academy. Appendix 1 is a chronological list of these District Engineers.

Jackson Street Wharf at St. Paul, Mississippi River in 1868. Notice original Wabasha Street bridge in the background. The steamer "Lake Superior" shown here was typical of the vessels plying the inland waterways after the Civil War.

PRESERVATION OF THE FALLS OF ST. ANTHONY AT MINNEAPOLIS

GENERAL Warren was the first to suggest that at one time the ancient glacial lake Agassiz in northwestern Minnesota had been drained by a river which, blocked by an ice sheet to the north and in seeking its way to the sea, flowed south and east to form the valley in which the Minnesota River now flows to join the Mississippi River, as well as the valley of the Mississippi below that juncture. This glacial river has been named the "Warren" in honor of the General.

When the glacial waters of the River Warren formed the valleys of the Minnesota and Mississippi, a falls developed just below the site of what is now the business district of St. Paul. The shallow topsoil there and throughout what is now the Minneapolis-St. Paul metropolitan area is underlain by a strata of Platteville limestone which rests on the St. Peter sandstone formation.

Since the limestone is sedimentary and hard, but fractures easily, and the underlying standstone is soft and friable with little or no cementation, the water at the falls tended to undercut the soft sandstone so that the limestone edge above collapsed. In this way a falls was formed, which gradually moved up river and eventually became St. Anthony Falls at its present site.

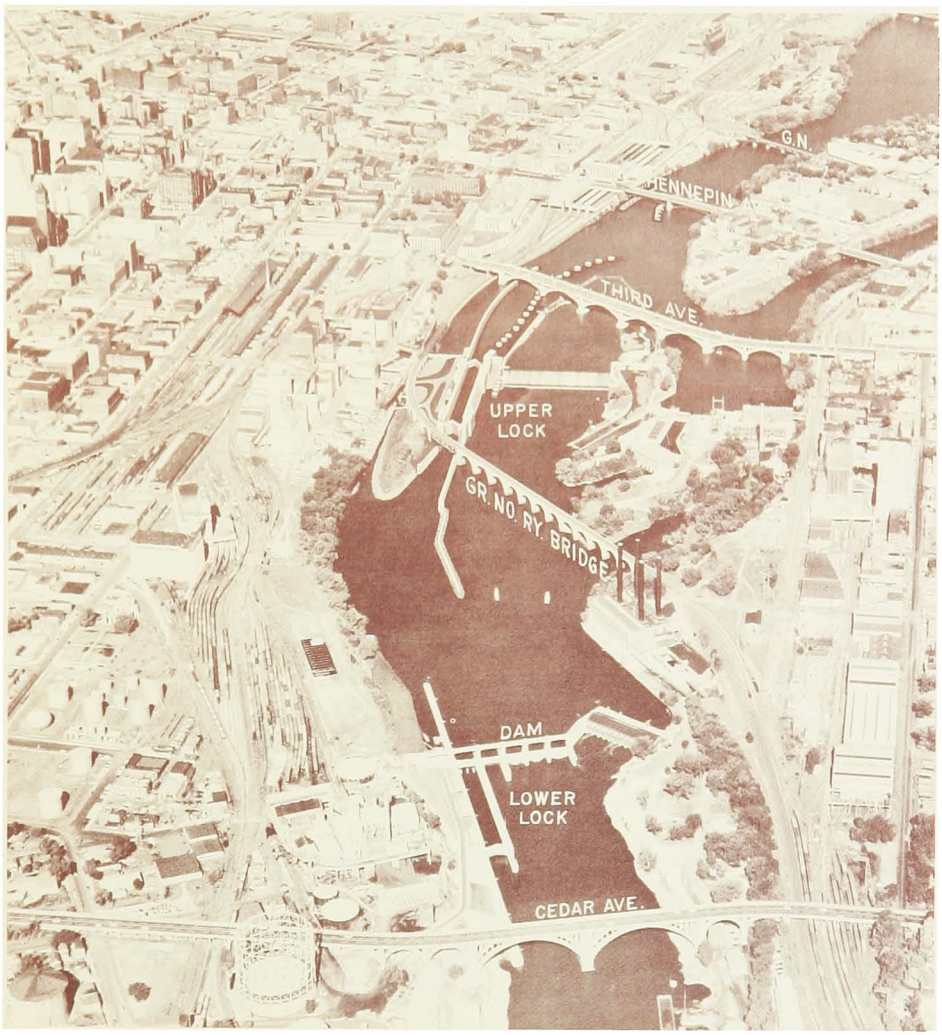
The regression of the Falls of St. Anthony was still in progress when in September 1868, a group of Minneapolitans, Messrs. Eastman, Merriman, Judd, and Wilder began excavating a tunnel from Hennepin Island at the downstream and east flank of the Falls of St. Anthony. This tunnel was to be extended upstream under the falls to Nicollet Island, and was to be used for the development of water power for adjacent industries. In October 1868, the tunnel collapsed, and the entire falls were threatened to be quickly eroded, leaving only a series of rapids and rendering useless the many adjacent lumber and flour mills dependent on the falls for water power.

In November 1869, General Warren inspected the breaks in the Eastman tunnel; and after a survey of the damage, recommended the construction of a timber apron over the falls to prevent further degeneration of the limestone ledge. The General also recommended the construction of a submerged concrete cutoff wall about 200 feet upstream from the crest of the falls, extending from bank to bank of the river.

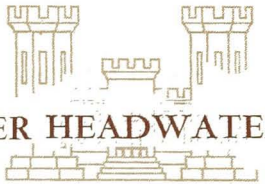
Work on the timber apron and the cutoff wall was started in 1870 under General Warren's direction, and continued intermittently for 15 years. The completed project consisted of three parts — two dams on the top of the limestone ledge upstream from the actual falls; a timber apron over the falls; and a concrete dike under the limestone ledge upstream to cut off percolation through the soft stratum beneath the limestone. After 1885, the Federal Government did no further work in protecting the falls. All additional revisions, repairs, and maintenance

of the dams adjacent to the falls were carried on by the Minneapolis Mill Company and the St. Anthony Falls Water Power Company.

Sustained high flows in the spring and early summer of 1951 ripped away a large portion of the timber apron, leaving the falls in almost its natural state. Northern States Power Company, the parent company of the Minneapolis Mill Company and the St. Anthony Falls Water Power Company removed all remaining rock fill and timbers and installed a more durable concrete spillway in place of the wooden apron. A string of sheet pile cells was built across the toe or downstream end of the new concrete apron and capped with concrete to form a stilling basin.



Schematic Plan of Minneapolis Upper Harbor, Mississippi River



MISSISSIPPI RIVER HEADWATERS RESERVOIRS

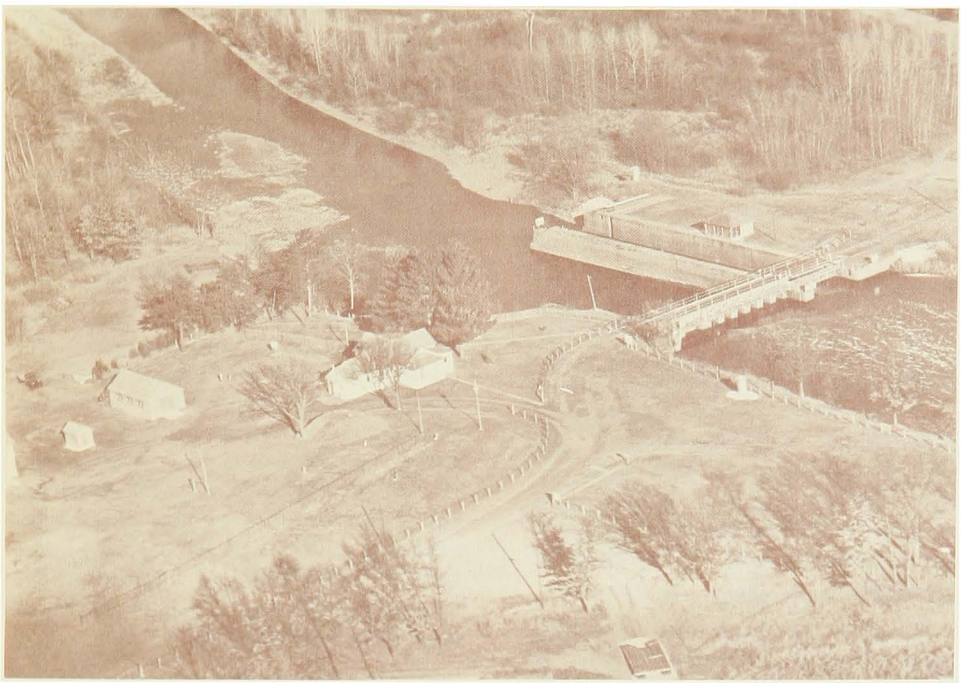
THE Mississippi River in its original state was a series of deep pools separated by shoals and rapids. The channel was obstructed by bars and snags; and during low water in late summer and autumn, so little water ran in the Mississippi River that boats had considerable trouble making the trip between the head of Lake Pepin and St. Paul. Steamboats laboring through the channel occasionally had to unload their entire cargo, passengers, and sometimes even cabin furniture to get over the sand bars. Beginning in General Warren's tenure as District Engineer, investigations were made by the Corps to determine the feasibility of constructing storage reservoirs at the headwaters of the Mississippi and its tributaries, to provide more water on the lower reaches of the river in seasons when navigation needed increased flows.

Simultaneous with the study of possible reservoirs in the Mississippi headwaters, studies were made on the feasibility of constructing reservoirs in the upper reaches of the St. Croix, the Chippewa, and the Wisconsin Rivers. The Board of Engineers appointed by the Secretary of War to review the plans and report of the District Engineer did not favor these reservoirs.

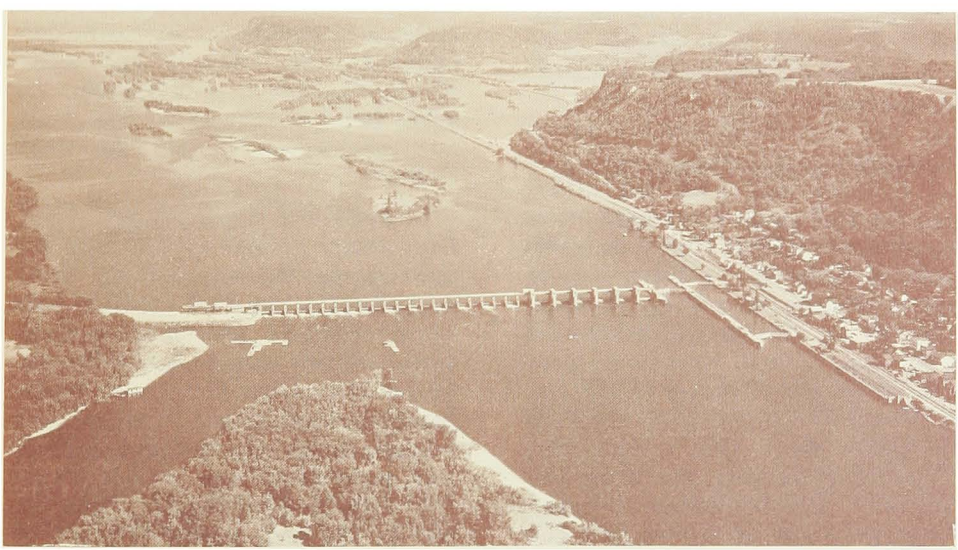
As a result of these studies, five reservoir dams — Winnibigoshish, Leech, Pokegama, Sandy, and Pine were built at the headwaters of the Mississippi. Three of these were placed in operation in 1884, and one each in 1886 and 1895. A sixth dam and reservoir (Gull) was placed in operation in 1912. Later, reconstruction of the original five dams became necessary, and this was accomplished between 1900 and 1911. The dam at Sandy Lake Reservoir was originally equipped with a navigation lock; but in 1958, this lock was converted to a part of the spillway by the insertion of stop logs upstream from the upper lock gates. Although the construction of these reservoirs was primarily in the interest of navigation, their operation has also been very beneficial with respect to water power and paper industries, municipal water supplies, pollution abatement, flood control and recreational developments. Even at present, with canalization of the river between the Twin Cities and St. Louis, the storage in these reservoris constitutes an important safeguard to the navigation project.*

Somewhat later, the Congressional Act of 3 June 1898 authorized the construction of a dam and reservoir on the Rum River in Mille Lacs County, Minnesota, for the aid of navigation on the Mississippi River. This was to have been a part of the upper Mississippi reservoir system. Again on 25 July 1912, Congress authorized construction on the Rum River at or near Onamia, Minnesota, a dam thereby creating reservoirs on Mille Lacs and Onamia Lakes, to improve navigation on the Mississippi River. These dams and reservoirs were never developed.

*See "The Upper Mississippi Reservoirs", by Lucille M. Kane, Gopher Historian, Spring 1962.



Typical Mississippi River Headwaters Reservoir Dam
Sandy Lake Dam



Typical Lock and Dam on Mississippi River — Aerial View Looking Upstream of Lock and Dam No. 4 at Alma, Wisconsin

IMPROVEMENT OF THE MISSISSIPPI RIVER

CHANNEL improvement for navigation in the Mississippi River within the St. Paul District can be arbitrarily divided into two phases. The first of these is the canalization of the river downstream from the Falls of St. Anthony in Minneapolis; and the second was channel rectification and improvement upstream from Minneapolis, particularly in the reach of river between Brainerd and Grand Rapids, Minnesota.

As early as 1824, the Congress began to take an active interest in improving the inland waters of the United States for navigation. At that time the Corps of Engineers was authorized to carry out improvements for the movement of commercial vessels on the Ohio and the lower Mississippi, first, merely by the removal of snags and wrecks, later by revetments, solid dikes and closing dam.

Work on the Upper River

In the 19th century, navigation on the Mississippi River upstream of St. Anthony Falls was confined largely to the floating or rafting of logs, although in the early development of the region, small steamboats were operated in some reaches of the river. Between 1875 and 1879, the Federal Government spent a small sum of money to remove the worst obstructions to navigation between Minneapolis and St. Cloud; and one small steamboat made occasional and difficult trips to St. Cloud during this period. Maintenance work ceased in 1879 because of the lack of funds and was never resumed.

Upstream from Brainerd, the greatly reduced river slope, the intensity of lumbering operations after 1870 and the absence of modes of transportation other than by river made improvement of the Mississippi feasible. Steamboats operating on the upper reaches of the river were essential to the then flourishing lumbering operations in the area by bringing both supplies and laborers to isolated lumber camps.

For many years, the Corps of Engineers maintained a channel of from 3 to 5 feet deep and 200 feet wide on the Mississippi River between Brainerd and Grand Rapids, Minnesota, by dredging, construction of wing dams and cutoffs, and removal of boulders, snags and overhanging trees. The last new work of this kind was accomplished in 1916; but maintenance of the channel was continued into the mid-1920's.

In 1964, the Aitkin County Land Department prepared a brochure describing the Mississippi River within Aitkin County. This brochure lists 12 river boats operating between Grand Rapids and Aitkin in the period 1871 to 1921. These boats which brought supplies and personnel to lumber camps in northern Minnesota, were either stern or side-wheelers, with lengths ranging from 30 feet to 140 feet, widths of from 14 to 24 feet, and drafts of from 14 inches to 3 feet. The Corps dredge, "Oriole," which was used for chan-

nel maintenance between 1908 and 1918, is included in this list.*

Abandonment of the navigation project on the Mississippi River between Brainerd and Grand Rapids was recommended in June 1926. Nevertheless, even today there are highway bridges across the Mississippi River at Aitkin and Cohasset, Minnesota, equipped with movable spans to permit passage of vessels; and the Congressional Acts authorizing construction of privately-owned dams across the upper reaches of the river specified that the design of each dam be such that "there can at any time be constructed in connection therewith a suitable lock for navigation purposes."

Work on the Lower River

A congressional act of 1868 granted 200,000 acres of land to the State of Minnesota to aid in the construction by private interests of a lock and dam on the Mississippi River at Meekers Island in Minneapolis, about 3 miles downstream from the Falls of St. Anthony. Construction of this lock and dam was never undertaken because of excessive costs. From 1867 to 1893, the St. Paul District surveyed in some detail the Mississippi between St. Paul and Minneapolis; and a continuing project between 1866 and 1917 covered a survey of the Mississippi downstream from St. Paul.

A 4½-foot channel on the Mississippi River between St. Paul and the mouth of the Missouri River was authorized in 1878. Development of such a channel was to be accomplished by means of wing dams and the closure of chutes.

In 1890 extension of the 4½-foot channel from St. Paul to Minneapolis was authorized. Navigation on the river in its natural state upstream from St. Paul to Minneapolis was hazardous, at best. During high flows the current was swift, and during low flows navigation was almost impossible due to the presence of boulders. To establish the 4½-foot channel boulders were removed and the river was dredged.

In 1894 the Congress authorized construction of the Twin City lock and dam No .2 as part of a project for two dams to improve navigation in the Mississippi River between Fort Snelling and the Washington Avenue bridge in Minneapolis. This dam, located near the Minneapolis-St. Paul city limits, was placed in operation in 1906.

In 1899 Congress authorized the construction of lock and dam No. 1 at its present location adjacent to the Ford Motor Company plant. When, in 1907, the Congress authorized a navigation channel on the Mississippi River with a minimum depth of 6 feet between the mouth of the Missouri River and Minneapolis, the lock and dam No. 1 project was modified to allow for a required channel depth of 6 feet.

In 1910, Congress authorized the increase in height of lock and dam No. 1 to permit the production of power and at a later date by the Ford Motor Company. Thus, lock and dam No. 2 was no longer necessary. Lock No. 1 became operative in 1917 and the old lock and dam No. 2 was abandoned.

The 6-foot chanel was further improved by the construction on the Mississippi River near Hastings, Minnesota, of the new lock and dam No. 2, between 1927 and 1930. The lock which is still in use, is 110

*See "Steamboating on Mississippi Headwaters" by Irving Harlow Hart, Minnesota History, Spring 1952.

feet wide and 500 feet long The lock sills were constructed to accommodate a 9-foot channel in anticipation of increased depths to be authorized later. The congressional act of 3 July 1930, which was later modified in 1935, authorized the construction of a series of locks and dams with supplemental dredging to provide a navigation channel with a minimum depth of 9 feet and widths suitable for long-haul common carrier commercial service on the Mississippi River between Minneapolis and the mouth of the Missouri River. In developing this 9-foot channel, a second lock, 110 feet wide and 600 feet long was constructed landward of the original lock No. 2 at Hastings, Minnesota.

As a result of the 1930 act authorizing the 9-foot channel, the Corps of Engineers maintains on the upper Mississippi River, 29 locks and dams at intervals of from about 10 to 50 miles between St. Louis and Minneapolis. Thirteen of these locks and dams are located in the St. Paul District. These locks form a series of "steps", which river tows climb or descend as they travel upstream or downstream. During low flows in the river in its natural state, the river was extremely shallow and its water surface had an irregular slope. The locks and dams of the project now form a series of lakes or pools in which the minimum depth is 9 feet below flat pool.

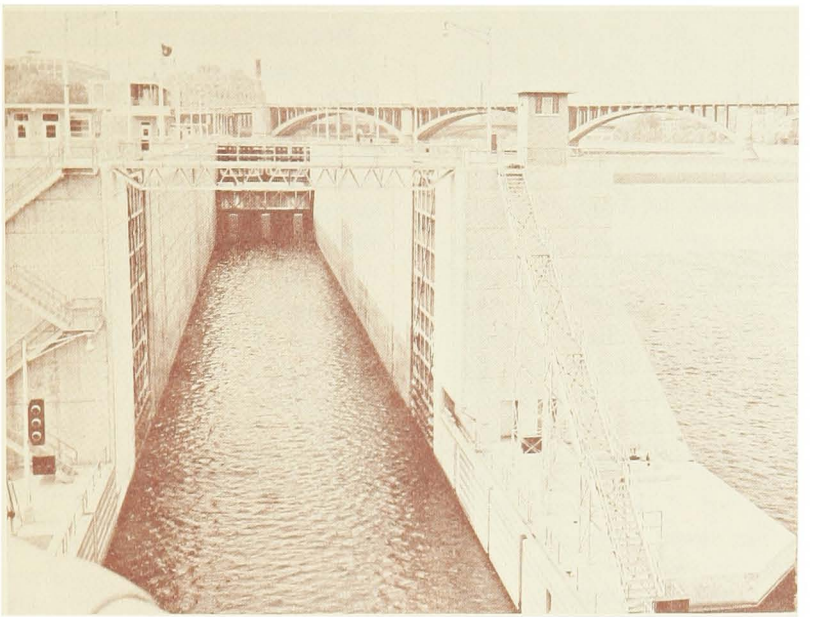
In general, the dams consist of 5 or 6 roller gates and a series of Tainter gates, spanning the main channel, and an earth dike with an overflow spillway. The piers, footings, sills, abutments, and walls of locks and dams are of mass concrete. In constructing the locks and dams it was necessary to acquire and clear all lands to be flooded and construct lockkeepers' dwellings, esplanades, roadways, fences and, in some cases, overhead or underground pedestrian passages at railroad crossings. Appendix 4 lists the locks and dams on the Mississippi River within the St. Paul District.

All of the locks with the exception of those at the Twin Cities locks and dam no. 1 and at St. Anthony Falls are 110 feet wide and 600 feet long. The locks at No 1 and at the lower and upper St. Anthony Falls structures are 56 feet wide by 400 feet along. The total cost of the Minneapolis Upper Harbor, including both locks, the new dam, dredging and the necessary highway and railroad bridge alterations, was approximately 32 million dollars; and the average cost of construction of each of the other 11 locks and dams in the district, including design, construction, electrical and recreational facilities, was approximately 5.6 million dollars.

The system of locks and dams on the Mississippi River was designed and constructed primarily for the benefit of navigation. In 1948, however, the Congress in Public Law 697, specified that in the management of the locks, dams and the pools created thereby, on the Mississippi River between Rock Island and Minneapolis, full consideration is to be given to the needs of fish and other wildlife resources and their habitat in such waters, to the maximum extent possible. The public law further specified that the pool levels were to be generally operated and maintained as though navigation was carried on throughout the year.

Minneapolis Upper Harbor Project

One of the more spectacular navigation projects of the St. Paul District was the extension of the



**View of Upper St. Anthony Falls Lock,
Minneapolis Upper Harbor, Mississippi River**

**View of Lower St. Anthony Falls Lock and Dam,
Minneapolis Upper Harbor, Mississippi River**

9-foot channel on the Mississippi River past the Falls of St. Anthony in Minneapolis as authorized by the Congress in 1937. This project made accessible by barge, about 4½ miles of additional river frontage on both river banks upstream from the falls.

Included in this project are a new dam consisting of 3 Tainter gates, replacing an old fixed-crest dam built by Northern States Power Company in the late nineteenth century; two locks, one at the new dam with a lift of 24.9 feet, and one on the right or west flank of the Falls of St. Anthony, with a lift of approximately 50 feet; some guide fences at the lock approaches and bridge piers; modification of several bridges to provide adequate clearances; and dredging over the entire length of the project. The City of Minneapolis contributed $1,100,000 in cash to the project, and in addition, modified the city-owned bridges within the reach of the Upper Harbor. The project was started on 2 October 1948; completed and opened to river traffic on 21 September 1963.

Prior to construction of the Minneapolis Upper Harbor, the Corps of Engineers made precise engineering studies of the area to be improved. Borings were made to learn more about the geology and rock formations of the falls. An intensive overall model study of the Mississippi River from the Hennepin Avenue Bridge to the Washington Avenue Bridge and detailed model studies of the locks' hydraulic systems at the University of Minnesota's St Anthony Falls Hydraulic Laboratory provided a basis for designing the lower lock and dam and upper lock. The models simulated river conditions, thus permitting determination of the most desirable location and design of the two locks and the new dam.

Benefits from Canalization of the Mississippi

Justification for the improvement of the Mississippi River downstream from Minneapolis is apparent in the increased use of the river by commercial waterborne traffic.

In 1935, 188,163 tons of goods were received in and exported from all ports in the St. Paul District by river barge; in 1964, approximately ten million tons were received and shipped. From 1935 to the close of World War II, shipments of coal and petroleum products into the district increased from practically nothing in 1935 to approximately 2.8 million tons in 1964. See Appendix No. 2. It is not an unusual occurrence for tows of from 15 to 17 barges to operate in the middle and lower sections of the river, and tows of 10 barges to move on the river in the vicinity of St. Paul.

In addition to facilitating this remarkable increase in commercial river transportation, canalization of the upper Mississippi River has improved the river's attractiveness for outdoor recreation by providing more stable water levels and year-round slack water pools for fishing, swimming, pleasure boating, hunting and picnicking. See Appendix No. 4.

Possible Future Developments

A resolution dated 21 September 1934 of the Committee on Rivers and Harbors, House of Representatives, authorized the Corps of Engineers to study the advisability of providing a practical navigation channel of a 12-foot depth between the mouth of the Illinois River and the existing head of navigation at Minneapolis.

The entire study of the proposed

12-foot channel was suspended in 1952; and no additional work has been accomplished since that date. Because of the anticipated increased tonnage to be moved on the upper Mississippi River, reconstruction of existing locks to provide 1200-foot lock chambers may be expected in the not-too-distant future. Experience on the Ohio River, and the 1200- foot locks constructed in the Chain-of-Rocks Canal and at Keokuk, Iowa, have demonstrated the advantages of larger locks, and that such locks have an economical justification. The traffic anticipated on the river may ultimately require 1200-foot locks at remaining sites along the river; and the use of these longer locks will permit the handling of longer tows propelled by higher powered, more efficient towboats for more economical transportation.

DEVELOPMENT OF RECREATIONAL AREAS

THE pools on the Mississippi River created by the navigation locks and dams, the reservoirs in the Mississippi headwaters area, and the reservoirs impounded by the various flood control dams within the district provide an opportunity for nearly every form of public outdoor recreation.

Following a nationwide policy of the Corps of Engineers, the St. Paul District is presently engaged in establishing recreational facilities at various locks and dams along the Mississippi River, at Baldhill, Homme and Orwell Reservoirs, and at five of the six Mississippi headwaters reservoirs. These facilities take the form of parking and picnicking areas, campsites, boat launching ramps and overlooks. For the enhancement of such facilities, the St. Paul District cooperates, whenever possible, with Federal and State agencies concerned with fish and wildlife development, forests, park development, and history.

Water skiing is a popular sport on the Mississippi River Headwaters Reservoirs in northern Minnesota. Old and young alike turn to the placid lakes for relaxation and enjoyment under warm summer skies.

THE ST. CROIX RIVER

IMPROVEMENT by the St Paul District of waterways for the benefit of navigation has not been limited to the Mississippi River. The St. Croix and the Minnesota Rivers and the Red River of the North have also been improved at various times for the free and unimpeded movement of river traffic.

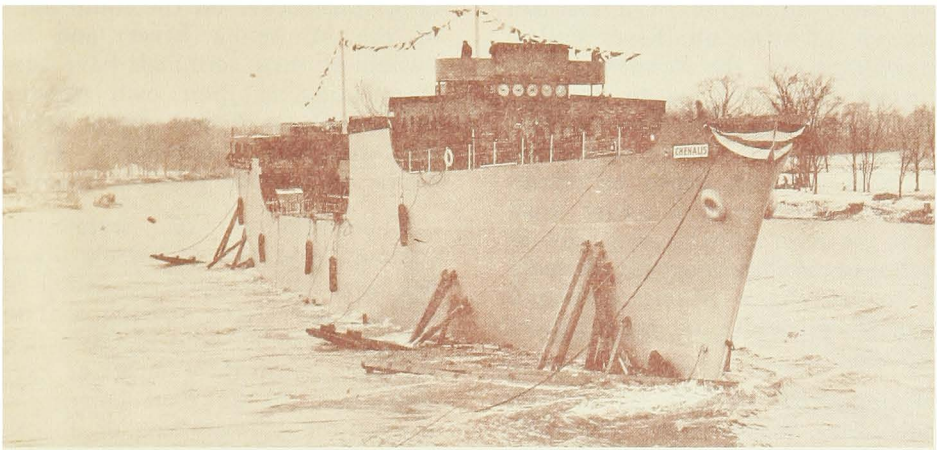
In his recent book, "The St. Croix, Midwest Border River," James Taylor Dunn, Chief Librarian of the Minnesota Historical Society, describes in some detail the operation of steamboats on the St. Croix between about 1850 and 1905. These boats were invariably paddlewheelers with shallow draft, and were used to carry both passengers on excursions and freight of all kinds. Further indication of steamboat activity on the St. Croix is found in the "Waterways Journal" which on several occasions, refers to shipbuilding and overhauling facilities at Stillwater. Large packet boats and boat construction facilities on the St. Croix are now things of the past.

In 1866, the St. Croix River in the vicinity of Catfish Bar opposite Afton, Minnesota, was surveyed and sounded; and the river from Taylors Falls to the mouth was mapped in 1878. At the same time, the Congress authorized a 3-foot channel on the St. Croix River from the river's mouth to Taylors Falls, Minnesota. The 3-foot channel was completed in 1900 by dredging and contracting works upstream from Stillwater, Minnesota, and by dredging downstream from Stillwater

Around 1900 the reach of the St. Croix between Stillwater and Taylors Falls was used to float logs from upstream forest areas to the sawmills, and regular steamboat service was maintained between the two communities. However, with the development of the railroads and highways and the movement of lumbering activities northwestward, commercial use of the waterway upstream from Stillwater declined to nothing. As a result, the channel below Stillwater was maintained at a project depth of 3 feet, but due to a decrease in navigation, high cost of maintenance, and a reduction in appropriations, work upstream from Stillwater was generally limited to snagging and clearing, with a resultant deterioration of the 3-foot channel to a controlling depth of one foot or less at extreme low water.

In 1930, a 6-foot channel on the St. Croix between the mouth and Stilwater was authorized. In this same reach of river, a 9-foot channel was established by the backwater of the Red Wing Dam No. 3 on the Mississippi River which was completed in 1938.

Limited commercial use of the lower St. Croix River was resumed in late 1929 when the Inland Waterways Corporation inaugurated commercial traffic between Stillwater and terminals on the Mississippi River. Barge traffic on the St. Croix since that time has never amounted to much, while excursion boats and pleasure craft have been the predominant users of the waterway.



Launching of Ocean-Going Tanker at Port Cargill, Minnesota River

THE MINNESOTA RIVER

COMMERCIAL navigation on the Minnesota River began with occasional and infrequent excursions by independent operators in the early 1820's, to points a short distance upstream from Fort Snelling.* The Treaty of Traverse des Sioux in 1851, which opened up the greater part of the lands in southern Minnesota to settlement by the white men, provided the initial stimulus to the concentrated use of the Minnesota River by commercial packet boats. During the 4 years following the signing of this treaty, continued low water during the summer and autumn retarded steamboating on the river; but beginning 1855 and continuing until about 1872, shallow draft stern wheeled packet boats made regular trips along the Minnesota River with scheduled stops as far upstream at Mankato, New Ulm and Fort Ridgely. One boat alone made ninety round trips between St. Paul and Mankato during the navigation season of 1867. During this era, Congress appropriated $127,000 for the removal of snags and boulders and for the general improvement of the navigation channel on the Minnesota River

Because of cut-throat competition among the packet boat operators, the uncertain and limited navigation sea-

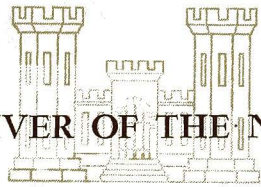
*See "The Early History of Steamboating on the Minnesota River," by William J. Peterson, Minnesota History, Volume 11, No. 2, June 1930.

sons and completion of a railroad through the Minnesota River Valley, steamboating on the Minnesota River after 1870, declined to nothing. The Congress in 1892, however, authorized the maintenance of a channel with a 4-foot depth to accommodate vessels with a 3-foot draft from the river's mouth upstream to Shakopee; at that time, the necessity of maintaining a channel upstream from Shakopee did not appear to be warranted.

Commercial navigation on the Minnesota River was practically non-existent from the coming of the railroads into the Minnesota country to the early years of World War II. In 1943, a 9-foot channel 100 feet wide was dredged upstream to Port Cargill at the expense of local interest, by the Corps of Engineers. This dredging at a cost of about $140,000 was accomplished primarily to facilitate the downstream movement of 18 Navy oceangoing tankers and 4 Army towboats built at Port Cargill near Savage as a part of the war effort. Since the war, 5 commercial terminals have been constructed on the south bank of the Minnesota River; and the owners of these terminals have been maintaining at their own expense the additional 5-foot depth below the federally authorized 4-foot depth, to provide a 9-foot channel.

Transportation of waterborne commerce on the Minnesota River has increased to such an extent in recent years (from 102,155 tons in 1950 to 2,339,000 tons in 1964) that the Congress in the summer of 1958 authorized the St. Paul District to assume the maintenance of the 9-foot channel with suitable widths, and the construction of cutoffs to eliminate certain difficult bends from the Minnesota River's mouth upstream to mile 14.7, a short distance upstream or west of Savage, Minnesota. Maintenance by the Corps of Engineers of a 9-foot channel and the incidental cutoffs on the Minnesota River from its mouth upstream to Savage was held up by court litigation involving the participation of local interests in the project; but this work was commenced in the District's centennial year.

Corps of Engineers Hydraulic Dredge "William A. Thompson"



RED RIVER OF THE NORTH

DURING the periods of exploration, fur trade, and settlement in the midwestern United States, canoes and bateaux plied the Red River of the North. Commercial navigation on the Red River began in the spring of 1859, 7 years before General Warren's arrival in St. Paul, when Anson Northrup launched his boat, the "Anson Northrup", on the Red River opposite the mouth of the Sheyenne River. Northrup had operated his boat for a brief period in the spring of 1858, on the Mississippi River between Sauk Rapids, Minnesota and Pokegama Falls.

This venture of Anson Northrup is a story unto itself. Gold had been discovered in 1858 in the Frazer River country in British Columbia. The city of St. Paul, Minnesota, claimed to be the logical starting point for the trek to the new gold fields, and its residents could see exciting possibilities for expanded commerce with the remote region to the north and west. To aid in funneling traffic from these northwestern regions to St. Paul, a committee of the newly formed St. Paul Chamber of Commerce took steps to encourage steamboat navigation on the Red River. This group offered a bonus of a thousand dollars to Anson Northrup, an early resident of the Falls of St. Anthony on the Mississippi, to inaugurate movement of both passengers and merchandise by boat down the Red River from what is now Fargo and Moorhead to Winnipeg.

Thus encouraged by his St. Paul backers, Northrup hauled the machinery and cabin of his boat overland from the mouth of Gull River near Brainerd, Minnesota, to the mouth of the Sheyenne on the Red River in the severe winter of 1858-59, built a hull, and on May 28, 1859, triumphantly inaugurated steamboating on the Red River. Northrup's St. Paul backers hoped that the advent of the steamboat on the Red River would expand and facilitate trade with the northern areas, shorten the trip between St. Paul and Fort Garry on the present site of Winnipeg that had to be otherwise made by oxcart, increase the amount of freight that could be carried, and provide for passenger service to connect with a projected stagecoach line.

For 20 years after Northrup's initial venture, steamboats plied the Red River bringing settlers, carrying supplies, and transporting grain. In 1878, however, the Canadian Pacific Railroad completed its line from Winnipeg to Pembina, North Dakota; and at about the same time, James Hill, the Empire Builder, extended his Great Northern Railroad from St. Paul into the Red River Valley. The advent of the railroads quickly put an end to operation of the steamboats on the Red River.*

Use of these steamboats on the

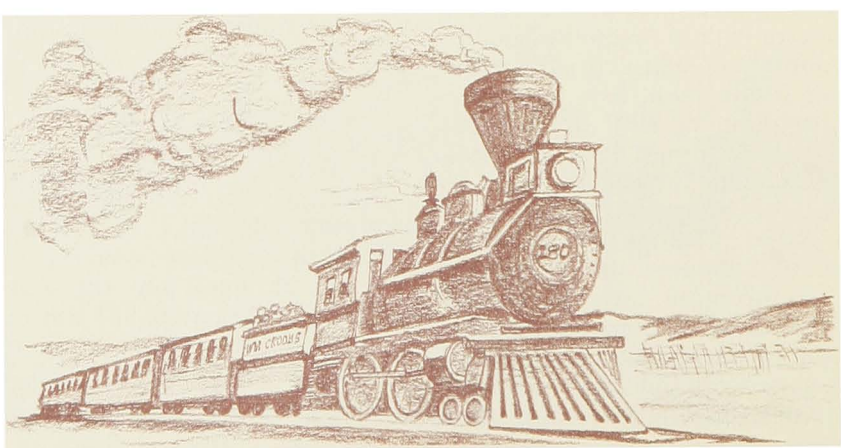
*Marion H. Herriot, "Steamboat Transportation on the Red River," Minnesota History, Volume 21, No. 3, September 1940.

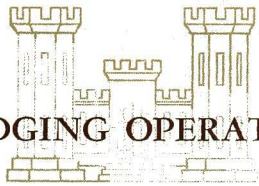
Red River of the North qualified the stream as a navigable waterway of the United States; and on this basis, the Congress allocated on a few occasions, funds for its improvement for the benefit of navigation by snagging, dredging, removal of boulders and construction of wing-dams. During the golden era of steamboating on the Red River, a lock and dam with a lift of 12 feet at Goose Rapids, and reservoirs on the Red Lake River and at Lake Traverse were proposed. Ultimately, however, river traffic had declined to the extent that these projects could not be economically justified. In the period of railroad expansion after the Civil War, navigation ceased; dams without locks and bridges with limited clearances were built; and continuous through commercial navigation is barred at the present time. The maintenance of a navigation channel on the Red River was abandoned in 1915. Current activities of the Corps of Engineers on the Red River of the North are limited to the control of floods and augmentation of low flows.

At various times, the St. Paul District has investigated the feasibility of improvement of the Wisconsin and Chippewa Rivers in Wisconsin. For a variety of reasons such as economics and the potential use and the characteristics of these waterways, the St. Paul District does not maintain any projects on these rivers at the present time. Another unusual project was considered by the St. Paul District as a result of the River and Harbor Act of 18 August 1894. This project was a proposed canal from Lake Superior to the upper reaches of either the Mississippi or the St. Croix River. Construction of such a canal was never justified economically.

Coincidental to work on the Red River, the River and Harbor Act of 19 September 1890 authorized a survey of Devils Lake in North Dakota to determine the cost of improvement by dredging to reestablish navigation. This survey indicated that the cost of the work would exceed the benefits to the public and no work was ever accomplished.

The River and Harbor Act of 3 March 1905 authorized the St. Paul District to survey for charting purposes only, Lake Minnetonka, in west central Hennepin County, Minnesota. Two detailed charts resulted from this survey; but the use to which these charts were put has not been determined.





DREDGING OPERATIONS

SEVERAL reaches of channel exist in the Mississippi and the St. Croix Rivers where suspended material settles out and gravel and rock are washed in from upstream, thus decreasing the river depths below the minimum necessary for navigation. Intermittent maintenance dredging by the Corps of Engineers is needed to provide an adequate channel for commercial tows and pleasure boating.

At the present time, the St. Paul District employs the derrickboat No. 767 and the hydraulic dredge "William A. Thompson" for maintenance and dredging on the Mississippi and St. Croix Rivers. The self-propelled dredge "Thompson" powered by a 1700 horsepower engine with a 20-inch discharge pipe was constructed in Pittsburgh by the Dravo Corporation and was placed in service on the Mississippi River in the early summer of 1937. This vessel bears the name of a 47-year veteran employee of the Corps of Engineers in the Rock Island and St. Paul Districts (1878-1925), who became an authority on improvements in open river channels, dredging methods, and wing dam construction.

Derrickboat 767 consists of a crane with a 4-cubic yard bucket mounted on a steel hull. This unit was put into service in 1941 to replace an older unit No. 566. No. 566 had been acquired in 1924, was first used on maintenance work at lock and dam No. 1 and later, within the limits of the district, on the entire reach of the Mississippi. In November 1941, No. 566 was sold to the River Transportation Company of Cincinnati, Ohio.

Mention of two earlier vessels once used in the St. Paul District—the "Elinor" and the "General Allen" — still arouse nostalgic memories for veteran employees of the District. These boats were used in maintaining the navigation channel on the upper Mississippi River and its navigable tributaries from the early 1920's to the early years of World War II.

"The Elinor" was a stern-wheeled coal-burning towboat with a steel hull and wood superstructure. It was built in 1905 at Jeffersonville, Indiana, at a cost of $55,205, and was transferred to the St. Paul District from the Corps of Engineers Rock Island District on 24 March 1931. The "Elinor" was sold to the Upper Mississippi Towing Company for use on the upper and middle reaches of the Mississippi. In November 1941, the vessel was purchased by the Greenville Sand and Gravel Company, rechristened the "W. W. Fischer," and placed in service on the lower Mississippi.

"The General Allen" was also a stern wheeled coal-burning towboat with a steel hull and wood superstructure, and was slightly larger than the "Elinor." "The General Allen" bears the name of the Corps officer who served as fourth District Engineer of the St. Paul District between July 1878 and November 1889. The maximum speed of this boat when light was about 9 miles

per hour. The "General Allen" was built in 1916 at the Howard Shipyards in Jeffersonville, Indiana, at a cost of $35,000 as a private excursion boat for the Doctors Mayo, the famous surgeons of Rochester, Minnesota. When the Mayo Brothers built their yacht "The North Star" in 1922, the United States acquired the "General Allen" for use as a work and inspection boat.*

Ultimately, the cost of operation of coal-burning towboats in contrast to the newer diesel fuel-burning vessels became excessive; and at about the start of World War II, both the "Elinor" and the "General Allen" were sold to private interests. The "General Allen" was purchased in 1943 by the Central Barge Company; and the original name "Minnesota", was restored. The vessel was then used in towing service on the several inland waterways including the Illinois, Ohio and Tennessee Rivers; and ultimately was beached at Joliet, Illinois, for use by Central Barge as an office and landing. When the Mississippi Valley Barge Line took over the Central Barge Company, it used the vessel as a landing boat at both Alton and Cairo. Eventually the Valley Line sold the craft to Captain Russel Warner in Memphis. In January 1966, two St. Louis entrepreneurs purchased the "Minnesota" from Captain Warner, and planned to use the vessel as a restaurant and night club at the St. Louis levee."**

Fountain City Boatyard

The St. Paul District maintains a boatyard on the left or east shore of the Mississippi River at Fountain City, Wisconsin. Here, during the non-navigation season, necessary repairs, overhaul, and maintenance of the dredge "Thompson", the derrickboat 767, and attendant floating plant can be accomplished. The Fountain City Boatyard was originally established by the Rock Island District in the days when the limits of the St. Paul District extended downstream on the Mississippi River only to St. Paul.

Prior to the transfer in 1919 of the Fountain City Boatyard to this district, the floating plant of the St. Paul District "wintered" near Andersons Bay on the St. Croix River, a short distance downstream from Stillwater. This site was bought from the Batchelder family in 1908 and was used until 1924 when the St. Croix facilities were consolidated with those at Fountain City. This Bayport wintering site included shipbuilding ways, a mill building used for the storage of launches during the winter and a house which served as a residence of the master of the motor vessel "Fury". Besides the "Fury", the dredge "Paly", the dipper dredge "Davenport", 20 barges and 3 quarterboats operated from this site.

Two veteran employees of the St. Paul District intimately associated with maintenance and stabilization of the upper Mississippi River are Howard M. Anderly and the late William P. Schmoker. Mr. Anderly, a civil engineering graduate of the University of Wisconsin, served with the Corps of Engineers from 1919 to 1952, and at the time of his retirement, had become an acknowl-

*Pictures and articles on the "General Allen" have appeared in the Waterways Journal in the issues of 27 October 1923, 10 March 1928, 28 September 1935 and 1 August 1936.

**See Waterways Journal, 22 January 1966

edged expert in open channel improvements on the Mississippi. Mr. Schmoker began his career as a deckhand on the district's dredging plant. During his more than 40 years of service with the St. Paul District, Mr. Schmoker learned by doing, nearly every facet of channel maintenance and dredging plant operation. At the time of his retirement in October 1958, Mr. Schmoker had attained the position of Supervisory Civil Engineer in charge of the district's Operations Division.

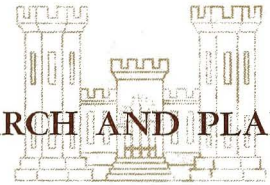
LAKE SUPERIOR, INTERNATIONAL BOUNDARY WATERS AND THE DULUTH DISTRICT

THE story of Corps of Engineers in the Duluth District began in 1861 when Captain George Meade of Civil War fame surveyed the Duluth-Superior harbor to determine possible improvements for navigation. These initial surveys and subsequent river, harbor, and flood control projects in Duluth, Superior, and elsewhere in western Lake Superior, were under the direction of the Corps of Engineers Chicago office, until 1886, when the Corps established a district office in Duluth.

Beginning in 1880 and continuing for four decades, the St. Paul District developed harbors at Warroad and Zippel Bay on the Lake of the Woods and exercised direct jurisdiction on the part of the Corps of Engineers over the international boundary waters between Minnesota and Ontario. On 31 July 1919, the international boundary waters draining into Hudson Bay were transferred to the Corps' Duluth, Minnesota District. In 1952, the Lake of the Woods and the international boundary waters were returned to the jurisdiction of the St. Paul District. Three years later the remainder of the Duluth District, encompassing the drainage basin of Lake Superior within the limits of the United States as far east as Au Train Bay, Michigan, was also incorporated into the St. Paul District.

Since assimilating the former Duluth District, the St. Paul District has continued the development of harbors around the periphery of Lake Superior, and the Duluth-Superior harbor and connecting channels necessitated by the completion of the St. Lawrence Seaway.

Because the present geographical area of the St. Paul District includes waters common to both the United States and Canada, the District Engineer represents the United States on several international boards and commissions. The international commissions are concerned with the use, maintenance, improvement, operation, and control of such waterways as the Souris and Red Rivers, Lake of the Woods, the international boundary waters, and Lake Superior.



RESEARCH AND PLANNING

INCIDENTAL to the design and construction of the locks and dams on the upper Mississippi River, the St. Paul District initiated extensive hydraulic model tests on the over-all lock design and the component hydraulic elements of these structures. From 1929 to 1948, a suboffice was maintained at the State University of Iowa's Institute of Hydraulic Research, to conduct such model tests; and from 1948 to 1958, these studies were continued at the University of Minnesota, St. Anthony Falls Hydraulic Laboratory. Initially this model testing program was limited to the navigation structures on the upper Mississippi River.

As time went on, the program was expanded to include the analyses of the hydraulic systems of locks on the Ohio, Tombigbee, the Warrior Rivers, and on the St. Lawrence Seaway. Several open channel models contributed to the ultimate design of flood control and channel correction works. Simultaneously, a program for the development and calibration of sediment samplers was carried on by the sedimentation subcommittee, Interagency Water Resource Committee.

From its inception, the district's hydraulic model study program was under the direction of Martin E. Nelson. A 1924 civil engineering graduate of the University of Minnesota, Mr. Nelson was employed for 3 years by the Southern California Edison Company; spent a year in graduate study at the Royal Technical Institute in Stockholm, Sweden; and in April 1929, assumed direction of the hydraulic research for the St. Paul District. Mr. Nelson, who has become a recognized authority on the design of navigation locks and on sedimentation problems, retired from the Corps in December 1965.

During World War II, the Corps of Engineers experienced difficulty in Alaska in constructing airfields, baracks, and similar installations on ice and on permanently frozen ground. As heat from the structures above ground penetrated the soil, the ice would melt leaving the ground unmanageably soupy. In 1945 the Permafrost Division was organized in the St. Paul District to study construction methods in the Arctic and its effect on the permanently frozen ground. This work continued in St. Paul for 5 years when the program was transferred, first to Wilmette, Illinois, and ultimately to the Construction Frost Effects Laboratory in Waltham, Massachusetts.

In a slightly different way, each project undertaken by the Corps of Engineers for the control of floods and/or the improvement of navigation facilities in inland waters, is subjected to detailed research, scrutiny, and analysis before recommendations are made to Congress for authorization, allocation of funds, and ultimate construction. The Basin and Project Planning Branch of the St. Paul District is concerned with this phase of work.

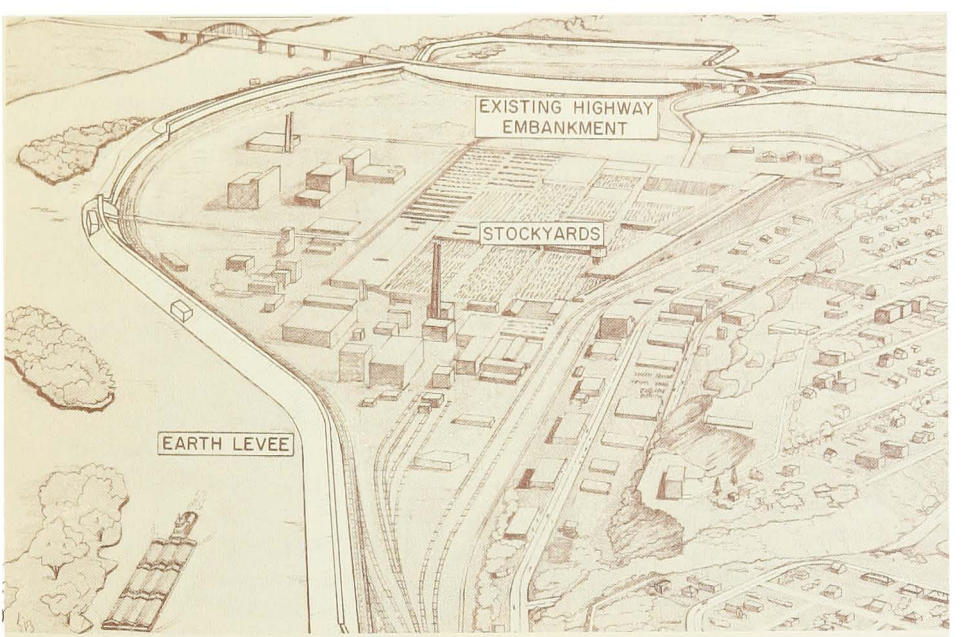
The Flood Control Act of 22 June 1936 broadened the scope of Corps

of Engineers activities by permitting Corps participation in improving the waterways of this country for flood control purposes. Typical of many flood control projects in the St. Paul District which received a favorable recommendation of the Project Planning Branch, and subsequently approved and constructed, are the St. Paul-South St. Paul project, the Orwell Dam and Reservoir on the Otter Tail River, Minnesota, the Baldhill Dam and Reservoir on the Sheyenne River near Valley City, North Dakota, the Homme Dam and Reservoir on the Park River, North Dakota, the Dry Run Diversion Project at Decorah, Iowa, and the Aitkin Flood Relief Project on the Mississippi River in north central Minnesota.

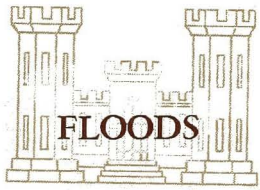
These flood control projects include detention reservoirs, channel improvement, local drainage, collection ditches and levees and flood walls. Although most direct benefits are reduction of floods or minimizing the effects of flooding, there are frequently other benefits. A reservoir, for example, can decrease downstream flows during periods of high water as well as provide a man-made recreation area for boating, swimming, hunting, and fishing.

In this connection, the Corps is currently planning and constructing several small-boat harbors and havens of refuge for recreational boating and pleasure craft throughout the St. Paul District.

The Flood Control Act of 14 July 1960 provided a means whereby the Corps of Engineers could assist State and local governments in helping themselves in planning flood control facilities. This act authorized the Corps to compile and disseminate information on floods and flood damages and to provide engineering advice to local interests for their use in planning to ameliorate flood hazards.



SO. ST. PAUL FLOOD CONTROL PROJECT



WITHIN the history of the St. Paul District, five disastrous floods on the Mississippi River and its tributaries have occurred — in 1880, 1881, 1951, 1952, and in 1965. A comparison of these floods is shown in the peak flows of the Mississippi River at St. Paul. In April 1881 a crest flow of 107,000 cubic feet per second was observed; in April 1952 the peak flow was 125,000 cubic feet per second; and on 16 April 1965, the maximum flow was 173,000 cubic feet per second. Each of these floods occurred in early spring and resulted from considerable snowfall during the preceding winter, persistent below freezing temperatures into the month of March, followed by a sudden increase in temperatures which triggered a rapid snow melt, rapid runoff and consequent flooding.

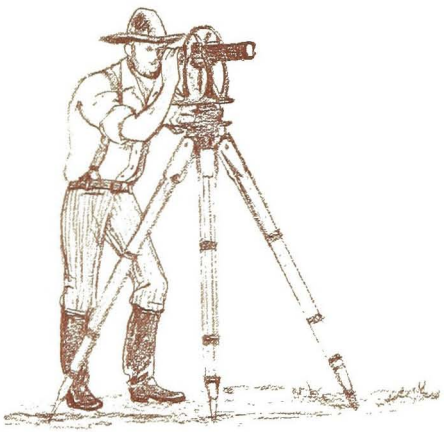
The 1965 flood was by far the most destructive flood of record and is illustrative of the Corps operations during periods of emergency. Nearly every tributary to the Mississippi in the central and southern portions of the district was affected in 1965, and before the flood emergency was over, nearly 50 million dollars damage resulted from the high water. The United States Geological Survey has estimated that in the 10-day peak of flooding at St. Paul, 800 billion gallons of water were carried down the Mississippi River — enough water to supply the needs of two cities the size of New York for nearly a year.

The Vermillion River at Hastings, the Zumbro River in Goodhue and Wabasha Counties, and the Root River in Fillmore and Houston Counties, normally sleepy little brooks, were the first to flood their banks in the first week of April 1965; and the Crow River, particularly at Delano, the St. Croix at Stillwater, and the Minnesota River at Mankato, crested shortly thereafter. Within a week, the Mississippi lowlands at Minneapolis and St. Paul were flooded, and the flood crest slowly made its way downstream to create considerable havoc and urban damage at Wabasha, Winona, and La Crosse. The 13 locks and dams on the Mississippi River within the St. Paul District were completely out of operation until early May delaying the navigation season about 6 weeks. Protective sheer fences at nearly every railroad bridge across the Mississippi downstream from St. Paul were damaged; and a pier of the Chicago Great Western Railroad vertical lift bridge at Robert Street in St. Paul, and a pier of the Great Northern Railway's "Stone Arch" bridge in Minneapolis were dangerously undermined. The flood attracted considerable attention nationally in the press and on television; and even President Lyndon Johnson with the Minnesota congressional delegation came out to have a look at the swollen Mississippi.

In this flood, as in others, the St. Paul District went into flood emergency operations. The office was staffed 24 hours a day to give continuous over-all direction to the op-

Mississippi River at St. Paul, Minnesota — Flood Conditions on 15 April 1965

1965 Flood Conditions at LaCrosse, Wisconsin
View Looking Southward on Copeland Avenue Toward Business District



eration; some 70 men were stationed at critical spots throughout the district to observe flood conditions, to advise and instruct local officials in flood fighting techniques, and to lend technical help when needed. Men were stationed at the headwaters reservoir structures, at power dams on the upper Mississippi River, and at the locks and dams on the lower river to place sandbags and otherwise stabilize the structures. As the flood subsided, many of the district employees remained in the field to assess the flood damages, to provide technical assistance in the process of cleaning up, and to accumulate data for a basis of future plans of preventive work.

An exciting incidental effect of flooding on the Mississippi has been unattended barges breaking loose from their moorings during floods and floating downstream. In April 1951, a barge loaded with 1,500 tons of coal was torn away from the Minneapolis Municipal Terminal upstream from the Washington Avenue Bridge on the Mississippi, and floated downstream until it was hung up on the dam at lock and dam No. 1. Since the dam is an Ambursen-type structure dependent only on friction between its base and the river bed for stability, this loaded barge poised a dangerous situation. Most of the barge's cargo was quickly removed, and the barge was partially sunk to remove the possibility of damage to the dam. When the floodwaters receded, the barge was refloated and towed away.

Three similar instances occurred during the 1965 flood. Two barges broke loose from the Minneapolis terminal; one barge crashed into the center pier of the Dartmouth Avenue Bridge and got stuck between the pier and west or right riverbank; the second barge floated downstream narrowly missing five bridges until it was stopped abruptly by a towboat just short of lock and dam No. 1. The second instance involved barges which broke away from the fleeting area at the Robert Street Bridge in St. Paul and crashed into the piers of the still incomplete Lafayette Street Bridge. At about the same time, a fleet of barges broke away from their moorings at the Holman Airport in St. Paul and ultimately caused congestion in the river as far downstream as Inver Grove. One barge was grounded and another barge collided with a pier of the Highway 100 Bridge crossing the river between Newport and Inver Grove with sufficiently great impact that the bridge was closed to highway traffic for nearly 24 hours to permit checking its structural stability.

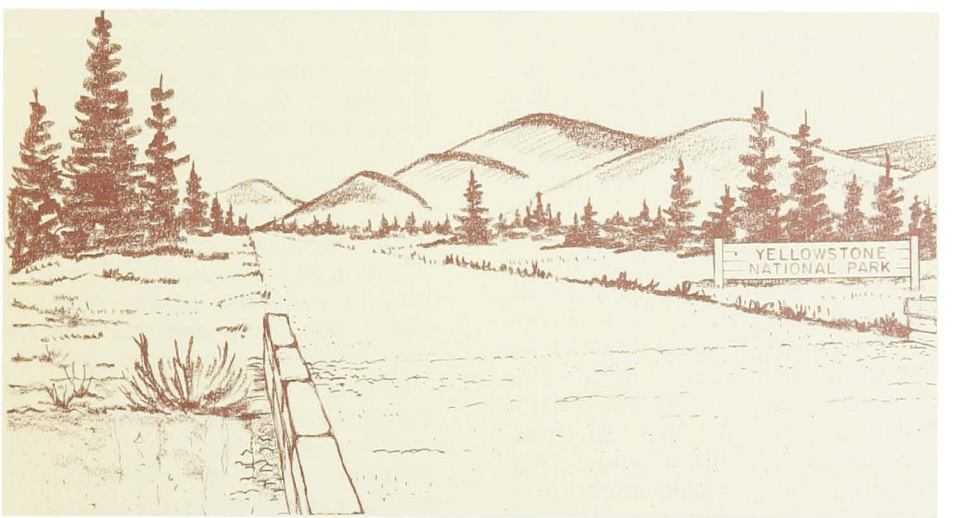
WORK FOR OTHER GOVERNMENTAL AGENCIES

FROM time to time, the St. Paul District has acted as an engineering consultant to other Federal agencies and, in certain instances, has assumed real estate functions and contract negotiations incidental to construction, supervision of construction, and performances of certain other activities incidental to the project.

Yellowstone National Park was established on 1 March 1872 "to preserve its natural curiosities, its forests and its game and to reserve its territory for the benefit and enjoyment of the people." For several years thereafter a combination of inept supervision and a lack of appropriated operational funds led to the indiscriminate poaching of game animals and misuse of the area and even wanton vandalism which produced results contrary to the purpose of the park. Ultimately, the supervision and care of the Park was entrusted to the U.S. Cavalry under the general direction of the Secretary of the Interior; and the congressional Sundry Civil Works Act of 3 March 1883 delegated to the Corps of Engineers the responsibility of construction, repair and maintenance of roads and bridges within the limits of the park.*

Beginning in the spring of 1883, the St. Paul District was in charge of the construction, improvement, and maintenance of the roads in

*Appendix EEE, page 3439, volume VI, Annual Report of the Chief of Engineers for the fiscal year 1894 contains a detailed description of this work.



Yellowstone. This work was transferred from the St. Paul District in September 1895 to the immediate supervision of the park superintendent. Although the National Park Service was organized in 1916, the Army's Cavalry and Corps of Engineers remained active in the Park's administration and improvement until June 1918.

The Corps of Engineers work in Yellowstone Park provided young officers an opportunity to gain valuable experience in road construction methods. The annual reports of the Chief of Engineers note that several Corps officers such as Captain Chittendon, Colonel Shunk, Major Peek, and Colonel Willing, who were later to become District Engineers of the St. Paul District, served at various times in the Park.

During the depression years in the 1930's, the Federal Government sponsored a number of relief or "made work" programs such as the Civilian Conservation Corps, the Works Progress Administration, and the Public Works Administration. For flood control projects constructed by these agencies within the limits of the district, the St. Paul District furnished engineering advice in a consulting capacity to these agencies. The late George E. Lyon, then chief of the Hydraulics Section, and later chief of the Engineering Divison, was directly in charge of this program.

During World War II, construction of airports at Fargo and Devils Lake, North Dakota, was accomplished by the St. Paul District for the Civil Aeronautics Administration; construction of the Twin Cities Ordnance Plant at New Brighton, Minnesota, and the Gopher Ordnance Plant near Rosemount, Minnesota, was undertaken for the Army Ordnance Corps. Minor building construction and extension of hospital facilities at Fort Snelling, construction of two large hangars for airplane modification at the St. Paul Airport, and reconstruction of buildings for the Eau Claire, Wisconsin, Ordance Plant were completed. Construction of a radio school at Tomah, Wisconsin, for the Air Force was also supervised by the St. Paul District. This military construction for other branches of the armed services is now centralized in the Corps Chicago District office.

An unusual wartime activity in which the St. Paul District participated was the construction by Cargill, Inc., of several oceangoing tankers and river towboats at Port Cargill on the Minnesota River near Savage, Minnesota. Eighteen AOG (auxiliary, oil, and gasoline) tankers were constructed for the United States Navy and four river towboats were built for the Corps of Engineers between May 1943 and June 1945. The St. Paul District's role in this shipbuilding program was the dredging of a channel 9 feet deep and 100 feet wide in the Minnesota River in 1942 and 1943, at the expense of local interests. In addition, the Corps assisted in procuring critically scarce materials and tools for the construction of these ships and towboats. In September 1963, a newspaper release reported that 14 of the AOG tankers made by Cargill were still plying the sea lanes and 4 are in layup basis. Typical of these salty AOG veterans is the USS "Tombigee," stationed at Pearl Harbor, Hawaii. During the spring of 1963, after being outfitted with special high-strength propellers the "Tombigee" plowed its way through Antarctic ice with a cargo of fuel and dry stores for "Operation Deep Freeze — '63," an international scientific expedition in the Anarctic.

Equally important but less spec-

tacular of the St. Paul District's contributions to World War II was the supervision and expediting of contracts for equipment and material needed by the armed forces in the war effort. Gasoline engines, component parts for Bailey bridges, clothing, and repair parts for construction equipment were a few of literally hundreds of items fabricated and inspected in this district and ultimately delivered to the armed services.

In the two decades since the close of World War II, the St. Paul District has continued its civil functions in planning, construction and maintenance of congressionally authorized flood control and navigation projects within the district. At the close of the district's first 100 years, a total of 36 flood control projects are either in various stages of planning and construction or have been completed and placed in operation. Thirty six small-boat and commercial harbors on the Mississippi River and in the Lake Superior area are being considered or have been provided for the convenience of navigation. Examples of such work are the St. Paul small-boat harbor on the Mississippi River completed in 1949, and the channel improvement and dam construction for flood control on the Eau Galle River at Spring Valley, Wisconsin, which was started in 1965.

Paralleling this work in controlling floods and assisting navigation, the Corps of Engineers nationwide program of national preparedness and civil defense has taken definite form in the St. Paul District. For a time in the postwar era prior to the transfer elsewhere of such activities, the St. Paul District supervised the construction of several missile sites around the periphery of Minneapolis and St. Paul. These installations were built for the protection of the metropolitan area against possible attack by approaching enemy aircraft.

The St. Paul District has been assigned the role of engineering consultant to the Office of Civil Defense in surveying available facilities in Minnesota. This continuing survey has several facets. Existing facilities in metropolitan areas are examined for adequacy as public fallout shelters; protection of radio stations in times of emergency has been studied to provide adequate means of communication to the public. Comprehensive studies are under way to establish control points or headquarters for local operations throughout the State and to insure that all centers of population in the area will have adequate community shelter plans.

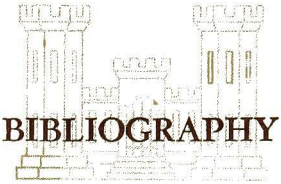
THE ST. PAUL DISTRICT – THEN AND NOW

FROM General Warren's time to the present, the geographical limits of the St. Paul District and the consequent nature and extent of the workload in the area have varied from time to time to meet the changing needs of navigation, the control of floods, and the planning, construction, and maintenance of projects authorized by Congress.

At the time of its inception the territorial limits of the St. Paul District were not defined. From 1869 to 1880, however, the St. Paul District was in charge of work on the Mississippi River upstream from the mouth of the Illinois River to its source including the headwaters reservoirs on the Minnesota, the St. Croix, and the Chippewa Rivers, on the Red River of the North, and on the international boundary waters between Minnesota and Ontario draining into Hudson Bay. After 1880 and continuing until 1919, the St. Paul District continued operations on the Red River of the North, the international boundary waters, the Mississippi headwaters reservoirs, the main stem of the Mississippi River downstream only as far as St. Paul, and tributaries of the Mississippi River in Minnesota and Wisconsin to and including the Chippewa River. Corps of Engineers operations on the main stem of the Mississippi River were accomplished by other downstream districts.

The year 1919 was a period of change. On 31 July 1919 the international boundary waters draining into Hudson Bay were transferred from the St. Paul District to the Duluth District, and on 1 December 1919 the jurisdiction of the St. Paul District was expanded to include the main stem of the Mississippi River down to the mouth of the Wisconsin River. These changes were adopted in conformance with a Corps of Engineers policy still in effect, that Corps districts are established to include the basins of one or more waterways rather than following artificial or political subdivisions' boundaries.

On 7 February 1930 the Wisconsin River Basin was transferred from the Milwaukee District; and in 1939, that portion of the Mississippi River Basin between the mouth of the Wisconsin River and Guttenberg, Iowa, was transferred from the Rock Island, Illinois District. These limits of the St. Paul District remained static until the mid-1950's when the former Duluth District was assimilated.



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Appendix No. 1

ROSTER OF DISTRICT ENGINEERS, ST. PAUL DISTRICT, CORPS OF ENGINEERS

		Tenure in Office	
		From	To
1.	Major General Gouverneur Kemble Warren	31 July 1866	31 May 1870
2.	Colonel John M. Macomb	1 June 1870	25 April 1873
3.	Major Francis M. Farquhar	26 April 1873	15 July 1878
4.	Major Charles J. Allen	16 July 1878	15 November 1889
5.	Major William A. Jones	16 November 1889	11 June 1895
6.	Captain Harry F. Hodges	12 June 1895	22 October 1895
7.	Lt. Colonel William A. Jones	23 October 1895	24 September 1897
8.	Major Frederic V. Abbot	25 September 1897	10 August 1900
9.	Major Daniel W. Lockwood	11 August 1900	27 May 1901
10.	Captain Hiram M. Chittenden	28 May 1901	30 September 1901
11.	Lt. Colonel Richard L. Hoxie	1 October 1901	14 November 1903
12.	Lt. Colonel George McC. Derby	15 November 1903	17 November 1906
13.	Colonel James B. Quinn	18 November 1906	7 June 1907
14.	Captain Edward H. Schulz	8 June 1907	4 September 1907
15.	Lt. Colonel Francis R. Shunk	5 September 1907	31 January 1912
16.	1st Lieutenant John N. Hodges	1 February 1912	12 March 1912
17.	Lt. Colonel Francis R. Shunk	13 March 1912	5 August 1912
18.	Lt. Colonel Charles L. Potter	6 August 1912	24 July 1915
19.	Major Ernest D. Peek	25 July 1915	20 October 1916
20.	Lt. Colonel Edward H. Schulz	21 October 1916	21 August 1917
21.	Colonel Daniel W. Lockwood	22 August 1917	19 November 1917
22.	Mr. George W. Freeman	20 November 1917	17 November 1919
23.	Major Henry C. Jewett	18 November 1919	31 July 1920
24.	Lt. Colonel Francis A. Pope	1 August 1920	28 February 1921
25.	Major Edwin H. Marks	1 March 1921	31 January 1923
26.	Major Charles F. Williams	1 February 1923	31 December 1923
27.	Major Edwin H. Marks	1 January 1924	30 April 1924
28.	Major Charles F. Williams	1 May 1924	19 July 1926
29.	Major Robert C. Williams	20 July 1926	8 August 1929
30.	Colonel Wildurr Willing	9 August 1929	16 June 1933
31.	Major Dwight F. Johns	17 June 1933	3 July 1937
32.	Captain Frank K. Albrecht, Acting	4 July 1937	23 July 1937
33.	Lt. Colonel Phillip B. Fleming	24 July 1937	17 October 1939
34.	Colonel John W. Moreland	18 October 1939	5 January 1943
35.	Lt. Colonel Lynn C. Barnes	6 January 1943	19 October 1945
36.	Major Henry J. Manger	20 October 1945	6 May 1946
37.	Colonel Walter K. Wilson, Jr.	7 May 1946	20 June 1949
38.	Major John D. Keefe, Acting	21 June 1949	14 July 1949
39.	Colonel Leverett G. Yoder	15 July 1949	11 June 1952
40.	Colonel Aldo H. Bagnulo	12 June 1952	26 August 1954
41.	Colonel Otto J. Rhode	27 August 1954	9 July 1957
42.	Colonel Desloge Brown	10 July 1957	17 July 1960
43.	Colonel William B. Strandberg	18 July 1960	31 July 1963
44.	Lt. Colonel Leslie B. Harding	1 August 1963	7 July 1966
45.	Colonel Richard J. Hesse	8 July 1966	

Appendix No. 2

NCSOD-S

ALL PORTS

COMPARATIVE STATEMENT OF BARGE TRAFFIC ON MISSISSIPPI RIVER AND TRIBUTARIES IN ST. PAUL DISTRICT

Calendar Year	Receipts-Major Commodities-Tons				Shipments Out of District-Tons		
	Coal	Gasoline	Other Petroleum Products	All Commodities	Grain	All Commodities	Receipts and Shipments
1935	54,709	6,513	-	158,047	-	30,566	188,613
1936	31,830	21,754	32	107,534	-	29,383	136,917
1937	44,601	46,052	18,433	202,158	-	23,099	225,257
1938	135,298	151,804	138,297	508,493	-	21,932	530,425
1939	200,209	175,326	134,533	615,912	13,631	56,767	672,679
1940	430,209	257,958	223,084	1,032,718	33,999	65,253	1,097,971
1941	571,976	273,233	314,292	1,290,087	31,954	69,490	1,359,577
1942	768,866	154,188	346,135	1,317,383	65,966	90,012	1,407,395
1943	333,794	249,836	393,415	1,008,414	108,892	119,053	1,127,467
1944	526,457	249,492	315,503	1,138,058	111,305	115,806	1,253,864
1945	556,104	281,823	353,186	1,211,206	48,612	52,787	1,263,993
1946	736,445	766,022	496,948	2,047,413	35,471	45,372	2,092,785
1947	615,908	788,048	511,379	1,973,679	16,672	46,724	2,020,403
1948	897,985	787,348	377,941	2,148,366	20,717	52,059	2,200,082
1949	959,427	929,752	484,962	2,452,759	25,009	35,197	2,484,856
1950	1,126,044	864,187	667,479	2,721,050	124,921	135,811	2,856,861
1951	1,048,728	760,869	698,970	2,548,767	180,610	228,995	2,777,762
1952	1,008,383	479,100	705,837	2,424,221	197,885	250,919	2,675,140
1953	1,261,859	910,719	584,443	3,052,144	267,844	334,233	3,386,377
1954	1,433,963	840,303	492,652	3,871,301	427,010	637,379	4,508,680
1955	1,578,229	920,243	580,415	4,281,615	815,900	995,130	5,276,745
1956	2,014,337	817,757	574,282	4,563,290	754,158	1,012,539	5,575,829
1957	1,681,530	753,926	390,855	4,356,974	1,246,468	1,480,604	5,837,578
1958	1,953,092	960,805	337,805	4,812,442	1,717,069	1,929,606	6,742,048
1959	2,276,537	926,914	738,023	5,514,736	1,575,008	1,699,422	7,214,158
1960	2,364,404	1,008,025	905,376	5,987,984	1,406,161	1,665,634	7,653,618
1961	2,481,693	1,047,955	1,029,438	6,023,021	1,317,251	1,581,991	7,605,012
1962	2,732,753	1,220,184	863,924	6,296,613	1,666,660	1,871,981	8,168,594
1963	2,809,859	1,117,820	1,102,942	6,725,593	2,314,128	2,540,768	9,266,361
1964	2,725,983	1,219,711	944,490	6,852,008	2,345,528	2,769,328	9,621,336
1965	2,858,200	1,163,623	584,299	7,036,668	2,543,110	2,860,660	9,897,328
1966	3,248,170	1,138,419	671,897	7,551,362	3,536,750	3,887,500	11,438,862
1967	3,317,800	1,042,288	681,217	7,716,333	3,485,255	3,825,792	11,542,125

Appendix No. 3

LOCKAGE DATA, ALL LOCKS, MISSISSIPPI RIVER, CORPS OF ENGINEERS, ST. PAUL DISTRICT

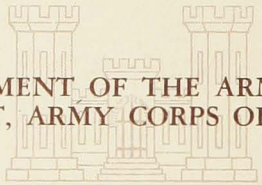
	Total Pleasure Boat Lockages, All Locks in District	Total Number of Lockages, All Locks in St. Paul District.	Total Number of Pleasure Boats Passing Through all Locks in St. Paul District.
1953	6,178	17,982	
1954	7,148	20,428	
1955	11,172	25,199	15,165
1956	15,173	29,036	21,985
1957	17,616	30,924	27,131
1958	24,939	39,251	42,431
1959	28,247	43,360	50,061
1960	27,810	43,359	51,928
1961	29,388	44,132	54,513
1962	26,208	41,721	47,214
1963	29,639	48,129	55,325
1964	32,351	51,985	58,412
1965	23,943	42,081	42,821
1966	29,789	50,489	54,222
1967	28,746	49,438	50,215

Appendix No. 4

DATA ON LOCKS AND DAMS, MISSISSIPPI RIVER, ST. PAUL DISTRICT

	Miles above mouth of Ohio River	Nearest Town	Normal Upper Pool Elevation (1)	Lock Dimensions		Upper Pool Elevation at Flood Conditions(1)				Composition of Dam		
				Usable Lock size in feet	Lift in feet	when lock goes out of operation	Previous Highwater 1880,1881	1952 Flood	1965 Flood	total length in feet	number of roller gates	number of Tainter gates
St. Anthony Falls-Upper	853.7	Minneapolis, Minn.	799.2	56 x 400	49.7					(2)		
St. Anthony Falls-Lower	853.4	Minneapolis, Minn.	749.5	56 x 400	24.4						None	4
1	847.6	Minneapolis-St.Paul	725.1(3)	56 x 400(4)	37.9(3)	732.7	730.7	733.0	734.47	574(5)		
2	815.2	Hastings, Minn.	687.2	110 x 500 110 x 600	12.2	690.2	689.3	689.37	697.75	822	None	20
3	796.9	Red Wing, Minn.	675.0	110 x 600	8.0	681.5	682.2	682.10	688.30	365	4	None
4	752.8	Alma, Wisconsin	667.0	110 x 600	7.0	669.5	672.3	671.17	676.48	1,367	6	22
5	738.1	Minneiska, Minn.	660.0	110 x 600	9.0	661.5	663.4	663.27	668.70	1,619	6	28
5A	728.5	Winona, Minn.	651.0	110 x 600	5.5	658.5	658.4	658.26	663.74	682	5	5
6	714.3	Trempleau, Wis.	645.5	110 x 600	6.5	650.0	651.3	649.53	655.70	893	5	10
7	702.5	Dresbach, Minn.	639.0	110 x 600	8.0	643.5	645.4	643.26	648.16	940	5	11
8	679.2	Genoa, Wis.	631.0	110 x 600	11.0	634.5	638.5	633.42	639.18	934.5	5	10
9	647.9	Lynxville, Wis.	620.0	110 x 600	9.0	629.5	629.0	628.50	633.81	811	5	8
10	615.1	Guttenberg, Iowa	611.0	110 x 600	8.0	619.5	620.1	616.22	624.24	763	4	8

(1) All elevations refer to mean sea level, 1912 adjustment
(2) St. Anthony Falls with protective structures
(3) With 2-foot vertical flashboards in place
(4) Size of both main and auxiliary locks
(5) Fixed crest Ambursen type dam



DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, ARMY CORPS OF ENGINEERS