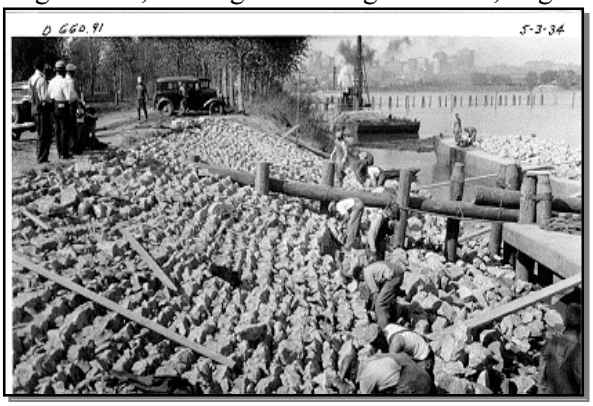
LOCKS AND DAMS AND RIVER NAVIGATION

History of the Mississippi River Navigation System

The Mississippi River we see today is in many ways a different river from the river of just one hundred years ago. Prior to efforts to the confine the river to a set channel and the implementation of lock and dam systems, the river was much wider and traveled through various meandering paths, with a channel that could shift in a matter of hours. During the drier periods in late fall it was said that you could wade across the river in some locations. The river boatman of this era faced a very challenging river with submerged trees, shifting sand and gravel bars, large rocks and even treacherous rapids. In fact, the diving bell was invented on the Mississippi River to aid in recovering goods from boats that went down on a daily basis.



Early on, the Army Corps of Engineers was charged with "improving the channel" for navigation. Government "snag boats" attempted to remove trees and other obstacles from the river. These boats were fitted with hook and heavy tackle to hoist out hazards. However, with the river constantly changing its course, these efforts were only marginally effective. In 1879 a river commission was established and charged with controlling the river's floodwaters. The first levees were built in an attempt to contain the river to a set channel. Revetments where constructed to encourage the deposition of sediments near the riverbanks with the goal of narrowing the width of river. Construction of these initial levees and revetments was a complex process involving setting posts, paving banks with rock and gravel, and weaving wooden "mattresses" (see pictures). The levee and revetment system now present on the river exceeds the length of the Great Wall of China.

As the river began to be contained, it no longer deposited its load of sediments over the surrounding land on its path to the sea. This sediment started to build up in the delta region near New Orleans, inhibiting travel by boat to the sea. Obviously this created a

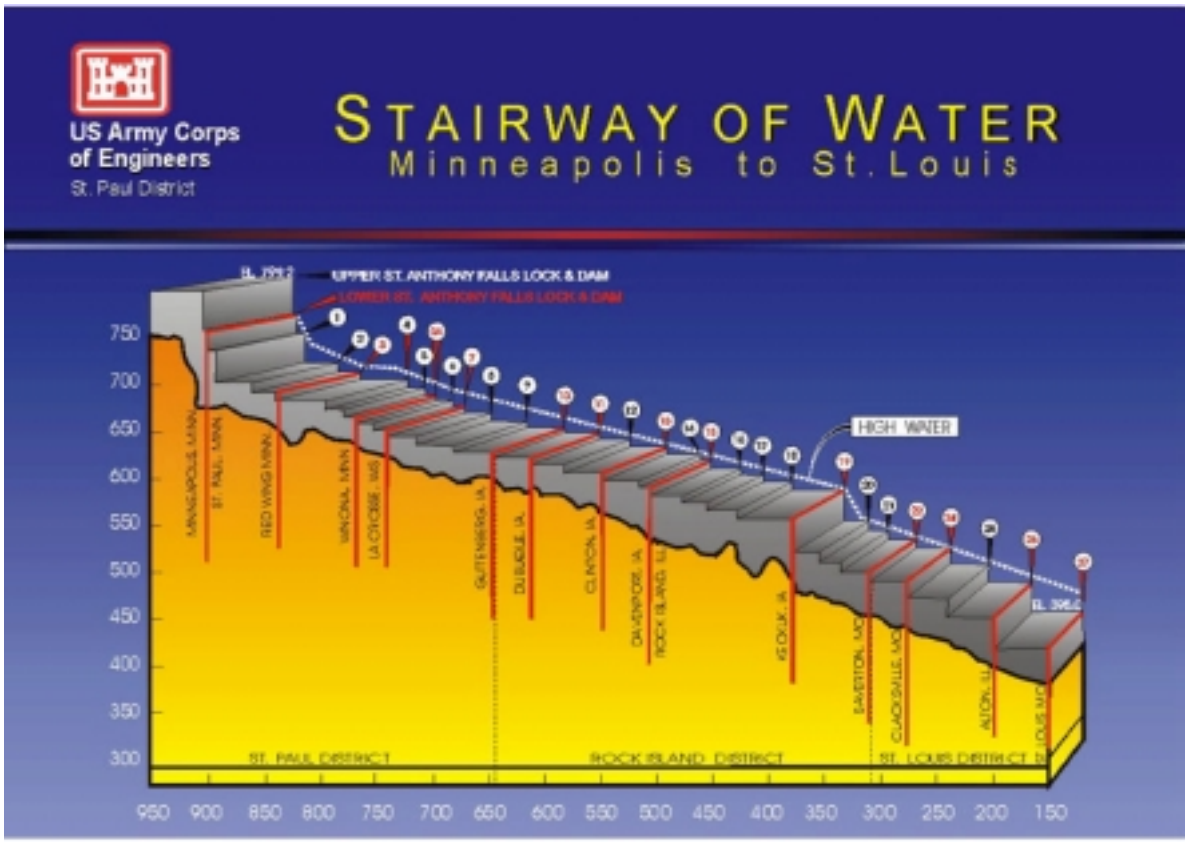
significant problem with the use of the river as a transportation system. The problem was solved by Captain James B. Eads, who was already famous for constructing the longest bridge of the time over the Mississippi River near St. Louis. Captain Eads bet the U.S. Congress 10 million dollars that he could solve the problem and create a channel at the river's mouth. His solution involved installing a series of jetties that directed the rivers current into a central channel. This caused the river's own movement to scour a channel clear of sediments. He solved the problem and won the bet. The basics of this approach can be observed up and down the river today in the form of "wind dams" used to direct the river's flow towards a channel, and assisting in maintaining a depth required for barge traffic.

An additional problem for river navigation was a series of rapids that occurred on the upper Mississippi River from St. Louis, Missouri to St. Paul, Minnesota. Over this 600-mile stretch of river the water fell more than 400 feet, often through boulder gardens, rapids or small water fall systems. In 1913 the first lock and dam on the river was built near Keokuk, Iowa. In 1933 the Army Corps of Engineers began the construction of a lock and dam on the river designed to tame the section of rapids that occurred near Rock Island, Illinois. Since this time a total of 27 locks and dams have been built on the upper Missouri River. As a result of this system, tugboats routinely travel the upper river with as many as 15 barges. Each barge can hold as much cargo as 58 semi trucks. Petroleum products from the oil fields of Texas and Louisiana are the largest bulk items moved up the river. Agricultural products are the principal downstream loads. A significant amount of the grain exported from the United States travels down the Mississippi River.

The system is not perfect however. With the river contained to a central channel, sediments are no longer deposited over the entire flood plain. In some regions of the lower Mississippi River sediments have built up in the river channel. In such locations, this has raised the level of the river and forced levees to be built taller and taller. When the river does flood and breaches the levee systems, the results can be devastating. Some have suggested that today's river may actually more flood prone, due to reductions in the natural absorptive capacities provided by a wide river plain, thousands of acres of wetlands and intact riparian zones. Additionally, as a result of the system of locks and dams, the upper Mississippi River no longer cycles through natural high water levels in spring and low water levels in the fall. This has impacted many of the species of wildlife that call the Mississippi home. As the impacts of the river's control system are becoming understood, efforts to mitigate some of the negative effects are underway. The Army Corps of Engineers has begun to work with state and federal agencies to restore some of the river's natural flow. Some sections of levees are being removed or are periodically bypassed in an effort to help create wetlands and conditions more conducive to wildlife.

How Locks and Dams Work

The lock and dam system was implemented to control the river levels and provide more reliable navigation. Often the locks were often constructed to submerge the portions of the river containing rapids. The system of 27 locks and dams now present on the upper Mississippi River essentially create a series of shallow lake systems called pools. When an upward bound boat reaches the upper end of a pool it passes into a chamber called a lock. The lower doors of the lock are closed and this chamber is then flooded and filled to the level of the water above the dam. The upper gates are then opened and the boat can exit the lock into the upper pool. The net effect is like putting a boat in an empty bathtub and then filling the bathtub so the boat can "climb up" to a greater height. This system allows boats to "walk" up a series of 27 steps on the upper Mississippi River from St. Louis, Missouri to St. Paul, Minnesota.



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