CORPS FACTS

Regulating Mississippi River Navigation Pools

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Historical Background

Federal improvements in the interest of navigation on the Mississippi River began as early as 1824. In 1878, the U.S. Congress authorized the first comprehensive project on the upper river: a 4 1/2-foot channel. This was followed by authorizations for a 6-foot channel in 1907 and a 9-foot channel in 1928, the depth that is being maintained at the present time.

To achieve a 9-foot channel in the Upper Mississippi River, the construction of a system of navigation locks and dams was authorized in 1930 and expanded in 1932, 1935, 1937, 1945 and 1958. The U.S. Army Corps of Engineers, St. Paul District has jurisdiction over the 13 uppermost structures -- No. 10 at Guttenberg, Iowa, to Upper St. Anthony Falls Lock and Dam in Minneapolis. These locks and dams, supplemented by dredging, maintain the 9-foot depth during the navigation season.

The Navigation Pools

The dams create slack-water pools for navigation during periods of low and medium flows. The locks allow river traffic to move from one pool to another like a stairway of water.

The Slack-Water Pool System

The average person may think of a dam as a huge solid structure used to block the flow in a river and form a lake. This is not true of navigation dams, like those on the upper Mississippi. These dams are not solid but are a series of concrete piers across the river with movable gates between the piers. A dam is formed when the gates are lowered, causing the water level upstream of the dam to rise and form a slack-water pool deep enough for navigation.

In order to operate the slack-water pool system, it was necessary for the federal government to acquire interest in all real estate that would be subject to flooding caused by the use of the dams. Much of this land is now serving the public for recreational purposes and as wildlife refuges. Some land is owned outright and some is covered by "flowage easements" allowing artificial flooding of privately-owned land, if necessary.

Open River

At times, the natural flow of the river provides a channel deep enough for navigation without the use of the dams. This usually occurs following the spring snow melt across the basin. When this occurs, the gates between the piers are raised completely out of the water so that the river flows free, just like an open river. Many people believe that the navigation pools should be drawn down before periods of high water are expected to provide storage

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capacity for the incoming flow of water. However, this drawdown cannot be performed for both physical and legal reasons**.**

The physical reason is that the pools do not contain sufficient storage capacity to accommodate flooding events. Even if each pool was completely emptied prior to an anticipated heavy runoff period, it would take only a matter of hours to refill them and this would not appreciably lower the peak river stages reached by the flood. This is because the amount of storage that could be made available by pool drawdowns is so very small in comparison with flood volumes. The legal reason for not drawing down pools is the "Anti-Drawdown Law." This act of Congress, dated March 10, 1934, is entitled, "An act to promote the conservation of wildlife, fish, and game, and for other purposes," as amended by Public Law 732 on Aug. 14, 1946, and again by Public Law 697 on June 19, 1948.

The "Anti-drawdown Law" directs that in the management of facilities (including locks, dams and pools) on the Mississippi River between Rock Island, Ill., and Minneapolis administered by the U. S. Army Corps of Engineers, full consideration and recognition is to be given to the needs of fish and other wildlife resources, including habitat. To the maximum extent possible, the law directs that the Corps regulation of the navigation pools take the needs of these natural resources into account, while maintaining navigation, without causing damage to property, and without creating additional liability to the government. The law also directs that the Corps shall generally operate and maintain pool levels as though navigation were carried on throughout the year.

Dam Operations

Each dam is operated to accommodate river flow conditions. In normal operation, all gates are partially open, to allow water to flow through. As the river flow increases or decreases, the gate openings are increased or decreased accordingly.

If there were no flow in a pool contained by an upper and lower dam, the water surface of the pool would be level throughout its entire length. However, if there is flow through the pool, there must be a slope to the water surface; the upstream end of the pool will rise as the discharge of the upper dam increases, and the downstream end of the pool will fall as the discharge of the lower dam increases, resulting in a drawdown at the lower dam. The water surface profile of the pool will tend to pivot about a point somewhere between the two dams. The pivot point is called the "primary control point," and its location is found to be at or near the point of intersection of the "project pool" elevation and the "ordinary high water profile." Court decisions have define ordinary high water profile as follows: "where the banks of a body of water are relatively steep, ordinary high water mark is coordinate with the limit of the bed of the water; and that, only, is to be considered the bed which the water occupies sufficiently long and continuously to wrest it from vegetation and destroy its value for agricultural purposes."

When the banks are low and flat, ordinary high water mark is to be considered "the point up to which the presence and action of the water is so continuous as to destroy the value of the land for agricultural purposes by preventing the growth of vegetation, constituting what may be termed any ordinary agricultural crop." On navigable lakes and rivers the Government of the United States holds an easement to sue the riparian lands up to ordinary high water mark, in the public interest.

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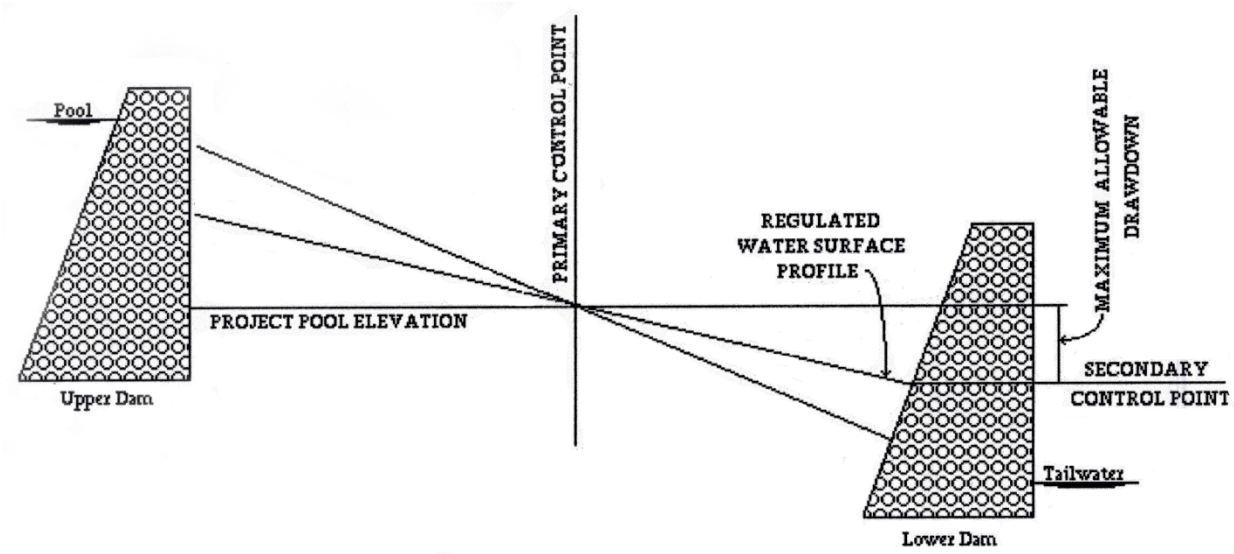
The primary purpose of the dams in the St. Paul District is to maintain a minimum channel depth of nine feet for navigation, and to accomplish this purpose, project pool elevations must be maintained at the primary control points. The operation of the dams is required at low and moderate flows in the Mississippi River, but the dams are not needed during high flows, and the movable dams must be removed from the water before flood stages are reached. Except for the water that goes into valley storage as the inflows increase, all inflow must be discharged.



BASIC PLAN OF OPERATION

In each pool, field surveys have established the ordinary high water profile, and the location of the primary control point has been determined. Project pool elevation is maintained at the primary control point, and the pool elevation at the dam is allowed to fall as the discharge is increased. However, the drawdown at the dam must be limited so that navigation and conservation interests in the area, from the primary control point to the dam, will not be damaged by extremely low water. The maximum allowable drawdown varies from 0 to 1 foot in the various pools, depending on local conditions. By using this method of operation, the inundated area for many smaller flood events is reduced, thereby greatly reducing the cost to the Government of acquiring flowage rights.

When the maximum allowable drawdown has been reached at the dam, control of the pool is shifted from the primary control point to the dam, and the pool is then said to be in secondary control. If, while the pool is in secondary control, the inflow continues to increase, the maximum allowable drawdown is maintained at the dam by increasing the discharge, and the stage at the primary control point and at all other points in the pool is allowed to rise. As the discharge is increased, the head at the dam will be decreased; and when the head has been reduced to less than one foot, the gates shall be raised out of the water, and open river flow will be in effect.

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When the river has been in open river flow condition and the pool elevation at the dam falls to the secondary control elevation, the gates are returned to operation and secondary control elevation is maintained at the dam until the stage at the primary control point has fallen to project pool elevation. Then, control of the pool is returned to the primary control point, and project pool elevation is again maintained at the primary control point.

This plan of operation, combined with the natural variation of flows, results in fluctuations of pool levels, which may at times cause some adverse effects. However, compensation has been paid to those affected by project operations, as authorized by Congress. Consistent with the basic purpose of the navigation project, which was authorized for and designed to make safe navigation of the Upper Mississippi River possible, every effort is made to cooperate with other activities, such as small-boat docks and harbors, farming, trapping, fishing, and other pursuits within the area of the pools.

This method of operation is used for all the navigation pools in the St. Paul District with the exception of: Upper St. Anthony Pool and Pool No. 1, which are controlled by hydropower interests; Lower St. Anthony Pool, which is too small to require this type of operation; and Pool No. 7, where all control is at the dam. Lock 10 is also a special case, since it was originally in the Rock Island District, and it has an operation plan developed by that district.

River Stages

The Corps of Engineers furnishes data on river stages and flows to the National Weather Service (NWS) forecast office in Minneapolis, Minnesota, which has the sole responsibility for issuing public warnings, watches, and statements on current river levels, as well as forecasts of expected flood crests. Daily river stages and flood forecasts are disseminated through the local media as well as the National Oceanic and Atmospheric Administration (NOAA) weather radio and weather wire. The NOAA weather wire is used by many local civil defense and police agencies.

The flood forecasts issued by the National Weather Service are referenced to elevation in feet above mean sea level (m.s.l.) or to stage, which is measured as the height in feet of the river level above an arbitrary reference point known as the gage datum.

If the elevation of the gage datum (zero of the gage) is known, forecasts referenced to stage may be converted to elevation by simply adding the datum elevation to the stage reading. Forecasts of stage or river elevations are not useful unless referenced to a known river level. The normal reference used for this purpose is the NWS flood stage at each location or the project pool elevation for each lock and dam pool. With these known reference points, river interests can use the current and forecasted river stages to determine how the forecasted river level relates to local topography.

Navigators who use the river commercially are familiar with these reference points and their relationship to a given river level. For safety reasons, those who use the river for pleasure or other purposes should become familiar with these reference points and the river levels which results in the most favorable depths and conditions for the particular activity in which they are engaged. Those interested in navigating a particular portion of the river should check river levels in that area.

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To obtain further information about pool regulation you may contact the St. Paul District Water Control Center at **651-290-5624.**

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