

CHANGING HISTORY AT ST. LOUIS— ADJUSTING HISTORIC FLOWS FOR FREQUENCY ANALYSIS

By Ronald J. Dieckmann, Hydraulic Engineer, and Gary R. Dyhouse, Chief, Hydrologic Engineering Section, Corps of Engineers, St. Louis, MO

Abstract In 1997, the Corps of Engineers embarked on a major re-evaluation of flood discharge and stage frequencies along the Lower Missouri and Upper Mississippi Rivers. The first step in the overall study, to be completed in 2000, is to develop a preliminary set of peak discharge data that is relatively homogenous. This requires that the effects of known biases, like historic flood discharge over-estimates and reservoir effects, be removed. For this data set, flood peak discharges at St. Louis prior to 1931 were adjusted downward to reflect the over-estimates made throughout the period when floats were primarily used for velocity measurements. Flood peak discharges recorded after 1957 were adjusted upward to remove the partial control by flood reduction reservoirs which came on line throughout the period to the early 1980's. Preliminary evaluations were made of peak discharge frequency at St. Louis using Bulletin 17B techniques and compared to the current discharge-frequency estimate for a no reservoir condition. The results using the revised data show a varying impact, ranging from almost nothing at common frequencies to about a 10% reduction for rarer events.

INTRODUCTION

Stages have been measured continuously at St. Louis, Missouri since the Civil War. Discharge data are available through periodic measurements made during this period, but the published values are the result of a variety of measurement techniques. The Corps took most discharge measurements at St. Louis prior to 1931, after which the USGS fully took over this task. The methods that the Corps used to obtain velocity measurements varied significantly from 1861–1931. Surface floats, single and double floats, rod floats, and various meters were used. Meter measurements were taken from both floating plant, subject to water movement, and from bridges. Only after 1931, when the USGS took over discharge measurements at St. Louis bridge sites using the Price Current Meter, have homogenous and reasonable accurate flood discharge measurements been available. Published peak discharges prior to 1931 for flood events have been found to be significantly over-estimated by several past investigations..

Similarly, changes in the upstream watershed, especially the construction of dozens of flood reduction reservoirs, have also had impacts on discharges at St. Louis. The first major reservoir, Fort Peck in Montana, was completed just prior to World War II, but reservoirs did not significantly impact the record at St. Louis until the late 1950's. Reservoir construction continued until the early 1980's and the record at St. Louis during the past 40 years includes lower flood peak discharges than would have occurred prior to reservoir construction.

Impacts of the 1993 Flood The 1993 flood produced record flood levels throughout all or portions of the five Corps Districts that comprise the Upper Mississippi River and Lower Missouri River Basins. The Lower Missouri River extends from the most downstream main stem reservoir (Gavins

