US Army Corps of Engineers
Rock Island District

Des Moines River Regulated Flow Frequency Study

Study Purpose – Following the 2008 Midwest flood, the U.S. Army Corps of Engineers, Rock Island District requested funding for a study to improve our understanding of flooding on the Des Moines River at and below the Corps' Saylorville Lake and Lake Red Rock reservoirs. The study included a scientific assessment of historical stream gage records to estimate the frequency and magnitude of future reservoir outflows and downstream river flows. This study effort helps to better identify and communicate the probability, or chance, of flood events; and assists in the planning and design of future flood-risk-management projects. This study has been titled the Des Moines River Regulated Flow Frequency Study.

In recent decades, the Des Moines River has risen higher and more often prompting the Corps to re-evaluate flow frequency estimates. This study sought to improve the characterization of flood risks on the Des Moines River including an update of reservoir pool-frequency relationships and the flood-flow frequency values downstream of Corps reservoirs. Flow frequency estimates were developed at river gage locations on the Des Moines River from Saylorville Reservoir to Keosauqua, Iowa.

The study involved an extensive review of historic river gage data, reservoir inflows and outflows, and river flow data for a period of record from 1917-2008. Data from the 2010 flood event was not included as the study was well underway prior to the event and it would not have been timely to incorporate the new data. The most recent update of flow frequency values, prior to this study, was made after the 1993 flood using data through 1994.

Study Findings – The Des Moines River Regulated Flow Frequency Study was completed in November 2010. Consistent with the large flood events the basin has experienced over the past several decades, the study results show that flood flow frequencies have increased over previous Corps estimates and that floods like the 1993 and 2008 events are more likely than previously estimated.

While there may be many underlying reasons why river flows and flooding have increased, the study was not designed or conducted to define the cause(s). The scope of the study was to examine river and reservoir data and project future flood probabilities. The study findings clearly indicate that flooding has been more frequent than previously estimated. Thus, floodplains adjacent to the Des Moines River and some areas once thought to be outside of the floodplain or protected by flood-risk-management projects have a greater risk of flooding than previously estimated.

The study results help to better identify the likelihood of flooding, allowing residents and property owners to better assess their individual flood risks. Further, the results assist the Corps, other agencies, and local governments in communicating those flood risks to individual property owners and communities; as well as provide design information for new projects or modification of existing projects.

With large floods occurring more often than previously estimated, it is important to be aware of your risk of flooding and to take appropriate action(s) to reduce future flood risk. The Corps is working with state and local governments and the Federal Emergency Management Agency (FEMA) to develop the way forward. It is too early to determine what impacts the results of this study will have on existing Corps flood-risk-management projects and reservoir operations, or on FEMA flood hazard mapping and levee accreditation. If you are interested in more information or following the Corps' actions concerning the results of the study, please visit us on the web @ http://www.mvr.usace.army.mil/PublicAffairsOffice/DMRRFFS/DMRRFFS.htm.

Understanding Flood Risk – The term "100-year" is used to describe a flood event that has a 1 in 100, or 1% chance (0.01 probability), of being equaled or exceeded each year. The occurrence of a large flood does not mean

(More Information on Reverse)

that similar flooding won't occur again in the near future. If the necessary weather conditions are present (persistent or heavy rainfall, snowmelt, etc.), flooding may occur again. Consider:

- The chance of a 100-year flood occurring is about the same as being injured in a car accident.
- During the span of a 30-year mortgage:
  - A house in the 100-year floodplain is 27 times more likely to experience a flood than a residential fire.
  - There is better than a 1 in 4 chance that a home in the 100-year floodplain will be flooded.

SUMMARY TABLES OF STUDY FINDINGS – The following tables provide flood flow frequency estimates on the Des Moines River at Corps reservoirs and SE 6th Street in downtown Des Moines, as determined by the Des Moines River Regulated Flow Frequency Study. Values for other Des Moines River gage locations can be found in the study.

	Saylorville Lake Release [1]		Lake Red Rock Release [2]	
Flood Event Probability	Previous Value	New Value	Previous Value	New Value
0.50 (2-year)	13,000 cfs	12,300 cfs	27,500 cfs	25,700 cfs
0.10 (10-year)	17,000 cfs	17,300 cfs	31,500 cfs	31,000 cfs
0.02 (50-year)	27,000 cfs	45,200 cfs	50,800 cfs	68,700 cfs
0.01 (100-year)	34,000 cfs	53,400 cfs	70,300 cfs	93,600 cfs
0.005 (200-year)	39,000 cfs	61,900 cfs	94,800 cfs	137,100 cfs
0.002 (500-year)	50,000 cfs	73,800 cfs	Not Estimated	137,100 cfs

Table 1 -New and previous Saylorville Lake and Lake Red Rock reservoir release estimates, as determined by the study.

	Saylorville Lake Release [1]		Lake Red Rock Release [2]	
Flood Event Probability	With Reservoir	Without Reservoir[3]	With Reservoir	Without Reservoir[3]
0.50 (2-year)	12,300 cfs	16,000 cfs	25,700 cfs	39,700 cfs
0.10 (10-year)	17,300 cfs	34,600 cfs	31,000 cfs	81,200 cfs
0.02 (50-year)	45,200 cfs	53,200 cfs	68,700 cfs	121,000 cfs
0.01 (100-year)	53,400 cfs	61,700 cfs	93,600 cfs	138,000 cfs
0.005 (200-year)	61,900 cfs	70,300 cfs	137,100 cfs	156,000 cfs
0.002 (500-year)	73,800 cfs	82,300 cfs	137,100 cfs	180,000 cfs

Table 2 - The reduction in Des Moines River flows attributed to the operation of Saylorville Lake and Lake Red Rock projects, as determined by the study.

	SE 6th Street, Des Moines [4]	SE 6th Street, Des Moines [4]
Flood Event Probability	Previous Value	New Value
0.50 (2-year)	25,400 cfs	26,300 cfs
0.10 (10-year)	40,400 cfs	44,100 cfs
0.02 (50-year)	72,000 cfs	83,300 cfs
0.01 (100-year)	87,000 cfs	107,500 cfs
0.005 (200-year)	106,000 cfs	122,100 cfs
0.002 (500-year)	Not Estimated	142,000 cfs

Table 3 - New and previous flood flow frequency estimates on the Des Moines River at SE 6th Street in downtown Des Moines, as determined by the study.

[1] Saylorville Lake's maximum flood pool is 890 feet National Geodetic Vertical Datum (NGVD29). When water levels reach elevation 884 feet NGVD29, water flows over the spillway. The maximum release through the Lake's conduit is approximately 21,000 cfs. Values above 21,000 cfs include flows over the spillway. The highest recorded outflow was 47,000 cfs on June 12, 2008.

[2] Lake Red Rock's maximum flood pool is 780 feet NGVD29. When water levels reach the maximum flood pool water flows through the controlled spillway comprised of Tainter gates. The maximum release through the Lake's sluice gates is approximately 37,700 cfs. Flows above 37,700 cfs are directed through the Tainter gates. The highest recorded outflow was 104,500 cfs on July 13, 1993.

[3] The values under "Without Reservoir" represent the predicted flows on the Des Moines River if Saylorville Lake and Lake Red Rock projects did not exist. As of 2009, these projects have prevented more than $730 million in flood-related damages along the Des Moines River. Note that these figures have not been indexed for 2011 price levels.

[4] The highest recorded flow at SE 6th Street, Des Moines, Iowa, was 116,000 cfs on July 11, 1993.

NOTE: cfs = The rate of flow past a given point, measured in cubic feet per second. One cubic foot = 7.48 gallons.

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