

USGS Streamflow Gages Available for Flood Forecasting

The US Geological Survey,(USGS)Iowa City, is pleased to announce the development of rating curves for 8 of 10 new streamflow gages supported by the Iowa Department of Natural Resources (IDNR). These sites are now available to the National Weather Service to be used as flood forecast locations. A rating curve is the graphical representation of the relation between stage (or gage height) and discharge (volume of water) at a particular stream or river gage, an example is shown in fig. 1.

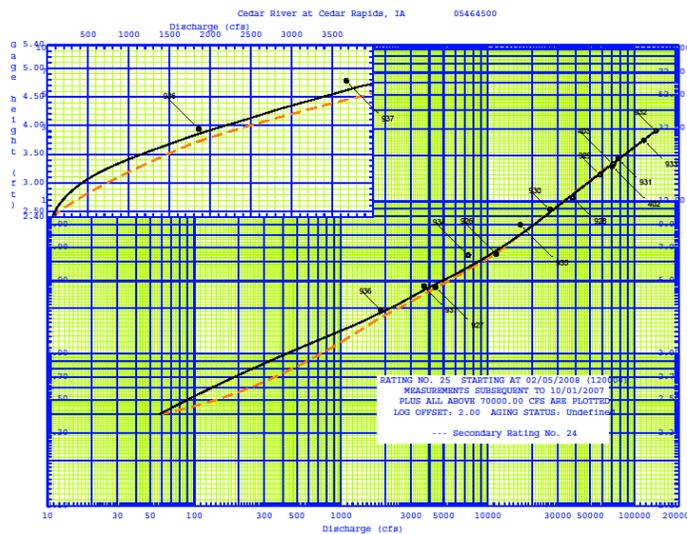


Figure 1

These rating curves are unique to each site and are constantly changing due to changes in the cross sectional area of the river bed. Changes can be caused by scour and fill (fig, 2 and 3), changes in vegetation, and man-made changes such as dredging and dikes. Because of these ever changing conditions, it is extremely important to be accurate in measuring the stage and the cross-sectional area of a river. Having just a general idea or a ‘something is better than nothing’ approach to flood warning can be misleading and potentially disastrous when making flood fighting decisions such as how high to build dikes or what areas should be evacuated.

The instruments and sensors used by the USGS are reliable and accurate to within 0.02 feet. The equipment has to be tested and approved by the USGS Hydrologic Instrumentation Facility (HIF) which is operated by the Office of Surface Water.

Most of the USGS streamgages in Iowa use a bubbler system and a pressure transducer to measure stage, however within the last ten years more gages are moving to RADAR

technology to measure stage. The USGS has chosen to use RADAR rather than SONAR because of its proven accuracy and its ability to be less affected by temperature, humidity, wind, and other issues.

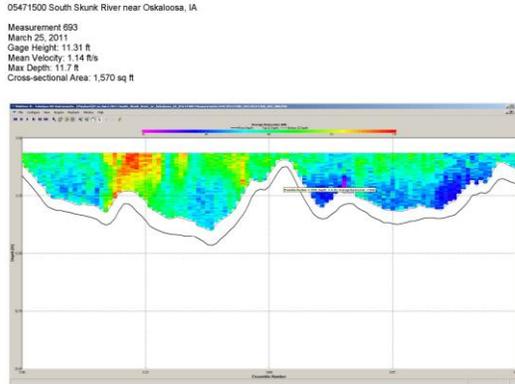


Figure 2

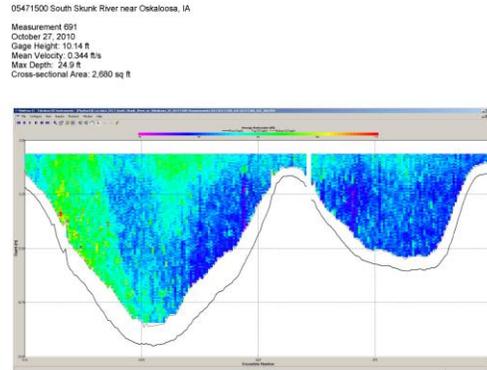


Figure 3

Figure 2 is a cross sectional snapshot taken on 3/25/11 with a discharge measurement of 1,790 cubic feet per second (cfs). Figure 3 is of the same location on 10/27/10 with a discharge measurement of 919 cfs. The difference in area is approximately 1100 sq ft. So with the stage being only slightly more than a foot higher, the amount of water flowing past the gage is almost double due to the scour of the river bed.

USGS personnel visit each gage in the state at least every six weeks to check and adjust the gage equipment, if necessary. As with all electronic and mechanical equipment, oversight and maintenance is mandatory to maintain accuracy. While at the gage, a manual discharge measurement will be made using an Acoustic Doppler Current Profiler (ADCP) (fig. 4) in order to verify and update the rating curve, if needed.



Figure 4

In between gage site visits, trained USGS personnel review the on-line information from each streamgage every morning to make sure the equipment is working properly. If a measurement looks suspect, a special trip will be made to the gage site to inspect and adjust the equipment. This type of operation and maintenance insures the best, non-biased, high-quality data are available to the public nationwide. USGS gages are surveyed in and set to Sea Level so the data can be compared to other locations and other elevations accurately, (fig.5).



Figure 5

The USGS has over 130 years of history and experience from which the USGS has developed stringent protocols and procedures which are followed by all USGS personnel across the Nation. Because of these protocols and procedures, USGS data are defensible in court and used by everyone from lawyers, emergency managers, modelers, bridge designers, engineers, canoeists, anglers, to homeowners.

A USGS program called WaterAlert was recently released and is available for public use. This service allows users to set notification thresholds of their own choosing for any USGS real-time streamgage, raingage, water-quality, or groundwater monitoring site. The system then sends emails or text messages to subscribers whenever the threshold conditions are met, as often as the user specifies. This program enables any USGS gage to essentially become a flood warning gage when the proper thresholds are set by the user. This program will send alerts to as many people as needed, such as the police dispatcher, emergency managers, mayors, city council, people who live near rivers, and anyone else interested in river conditions.

According to the National Weather Service (NWS) “The accurate flow data from the USGS is an essential part of NWS flood forecasts and warnings. Even small errors can negatively impact flood forecasts. USGS staff is available to the NWS 24/7 for flow measurements. Timely reports of flow measurements are also essential for accurate flood forecasts and warnings. Timely flow information allows the NWS to quickly compare those measurements to its river forecast models and make changes on the fly if needed.”

The majority of USGS streamgages throughout the United States and Iowa, are operated as full discharge gages, however, stage-only gages and seasonal gages are also in place. All of these gages are operated and maintained using proven, reliable equipment and follow the same strict protocols and procedures. The data from each of these gages are available on-line 24/7. Although, each of these gage types can be used as flood warning gages, only full discharge gages can be used by the National Weather Service as flood forecast sites because their flood prediction models rely on highly accurate discharge (water volume) values in order for their model to correctly predict the elevation and timing of flood crests.