

# **Missouri River Sediment Deposition**

## **Niobrara, NE to Springfield, SD**

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Mark Sweeney

Missouri River Institute and Department of Earth Sciences  
University of South Dakota

The growth of the delta into Lewis and Clark Lake has resulted in the filling of the Missouri River channel with sediment. The filling of sediment in the delta area has been tracked over time by the U. S. Army Corps of Engineers (USACE). Since the 1950s and about once per decade the USACE has made detailed measurements of the channel depth across the profile of the river. We have chosen two locations to document changes in the Missouri River channel in the area of the delta over time: 1) near Springfield, SD (1960 river mile 832.6) and 2) near the Standing Bear Bridge just east of Niobrara, NE (1960 river mile 840.6).

We used profile data collected by the USACE in 1955 (considered baseline data – the natural Missouri River prior to modification by the closure of Gavins Point Dam), 1975, 1995, and 2011 (post flood). The profile data in some cases includes over 300 individual measurements, allowing for detailed changes in the channel depth to be documented. To show trends over time to a general audience, the data was smoothed which allowed for a simplified channel profile.

In some cases, the river water elevation was documented at the time of data collection. For a point of reference, at each site we chose a representative water elevation. Near Springfield, SD the USGS gaging station has recorded average annual gage heights from 1987 to 2012. The average gage height over this time period is 1208 ft, which we use as the river water elevation on the cross sections. Long term data is not available for the Missouri River at Niobrara or the next upstream gage at Greenwood, so we used an estimate of the gradient of the Missouri River from Greenwood to Springfield, determined to be approximately 0.6 ft per mile. Using this information, a river elevation near Standing Bear Bridge can be estimated at about 1215 ft which corresponds well with exposed areas on the 2012 satellite imagery.

### ***Changes at Standing Bear Bridge***

In 1955, the Missouri River channel was located on the South Dakota side of the valley. By 1975, most of the old channel was filled in and a deeper, narrower channel hugged the South Dakota side of the valley. In fact, USACE profile data from 1965 (not shown) confirms that most

of the channel was already filled in by 1965, and little change in the size of the channel occurred from 1965-1975. On the Nebraska side, wetlands and sand bars were present. By 1995, the channel occupied the same location, and sedimentation had continued to build up in the old 1955 channel. The flood of 2011 deposited several feet of fresh sediment across the delta in this area and the main channel was slightly widened and deepened. In summary, between 1955 and 2011, substantial sediment deposition occurred in this area: greater than 15 feet of sediment accumulated in the old 1955 channel and 2 to 3 feet accumulated on old bars and wetlands. Most of the river's flow is now accommodated by a wider channel on the South Dakota side.

### ***Changes at Springfield***

In 1955, the Missouri River occupied multiple wide and deep channels in this area, with the deepest channel occupying the center of the valley and smaller channels towards both the Nebraska and South Dakota sides. By 1975, delta sediment had all but filled in these channels. The deepest channel remained in the center of the valley but was much narrower, and other smaller channels were similarly narrowed. Data from 1965 (not shown) reveals that most sediment filling occurred by 1965, similar to the Standing Bear Bridge area. Profile data and satellite imagery confirm that the delta became emergent (visible) between 1965 and 1975. By 1995, the main channel in the center of the valley had mostly filled with sediment. A narrow, deep channel persisted towards the South Dakota side and a new narrow, deep channel formed on the Nebraska side adjacent to the bluffs. The flood of 2011 deposited sediment across the delta and carved the channel on the Nebraska side even deeper. In summary, between 1955 and 2011, substantial sediment deposition occurred in this area although multiple small shallow channels have persisted that wind through the delta. About 20 feet of sediment filled in the 1955 channel and 2 to 5 feet accumulated across the growing delta.