**evaluation of mississippi river VALLEY Gravel bar Extents and Compostion from airborne electromagnetic data**

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The U.S. Geological Survey (USGS), in cooperation with the U.S. Army Corps of Engineers, contracted an airborne electromagnetic (AEM) survey of four reaches along the Mississippi River to map the thickness, extent, and composition of gravel bars to support ecosystem restoration and channel navigation. Each river reach contained several gravel bars, many of which are artificially stabilized by means of wing dikes, revetments, and/or low head dams. Many of these stabilization features were installed decades ago in response to several artificial meander bend cutoffs conducted in the wake of the flooding in 1927 and their suitability and effectiveness in keeping the navigation channel clear and providing coarse substrates as spawning habitat for benthic species is difficult to determine.

The survey was flown May-August, 2021 along 4 blocks of lines running roughly parallel to the river track: for a total of 1,1391 line-kilometers. The northernmost three blocks were collected with 250 m between the parallel grid lines and the southernmost was collected at a 100 m spacing. AEM data were acquired with the Resolve frequency-domain instrument measuring six frequencies (400 to 140,000 Hz) of in-phase and quadrature data. We ran a laterally constrained inversion with a model spacing of 25-m along flightlines. In addition, a spatially constrained inversion was run on the high-resolution 100 m spaced block.

The AEM surveys showed that the gravel bars were distinct features distinguishable from the riverbed and the subcropping aquifer units. Most of the bars in the study area were on the order of 10 m thick and the submerged extent of the bars was identifiable within the river channel. The submerged extent of the bars far exceeds the area of the bar exposed above the river surface. This leads to coarse deposits extending well out into the navigation channel. These incursions out into the navigable waterway extend well beyond the effects of the control structures and represent an increase in potential habitat for aquatic species and potential hazard to navigation during low flow events.