Assessing the use of the Upper Mississippi River as a model for rehabilitation of the Lower Mississippi River

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With 4 figures and 2 tables in the text

Abstract: Rehabilitation of Lower Mississippi River (LMR) floodplain habitats depends upon identifying realistic target conditions. Target conditions are best assessed through quantitative data that account for hydrological, geomorphological, and biological dynamics. A wealth of research and case studies are available for the Upper Mississippi River (UMR), but a paucity of target data exist for the LMR. A multidisciplinary team from the E.J. Meeman Biological Field Station explored the possibility of applying UMR target conditions to the LMR. To this end, we summarize studies of the dynamics of river stages, island morphometry, and channel variability for the LMR and compare results to published work from the UMR. Our results indicate hydrologic stage dynamics vary significantly between the UMR and LMR. Specifically, the UMR has decreased in hydrologic variability with fewer low flow events, while hydrologic variability increased on the LMR with greater differences between high and low flows. Periodicity analyses indicated different cycles of high and low stages, with the LMR having a more frequent periodicity. These differences suggest the hydrologic driving factors for riverine habitats are not comparable between the UMR and LMR. In addition, loss of river islands has occurred for different reasons on the LMR and UMR and planimetric channel changes have been higher along the LMR. Given these differences, it is unlikely rehabilitation models for the UMR will be applicable. The likelihood of removing engineered structures along the LMR is low, but the unique characteristics described above may be used in conjunction with engineering to rehabilitate LMR channel habitats. The rehabilitation must be designed to meet the needs of structures and functions of the LMR. Instead of specific spatial reference points, we propose using the historic reference period of 1900 and 1930 to guide future rehabilitation of sites along the LMR.

Key words: Interdisciplinary, quantitative, science transfer, hydrology, geomorphology, ecology, Mississippi River.

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