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Change in Lower Mississippi River Secondary Channels: An Atlas of Bathymetric and Photographic Data

Mississippi River Geomorphology and Potamology Report No. 8

Information is presented on the existing and long-term (1960s–2000s) trends in Lower Mississippi River (LMR) secondary channels to assist USACE and other agencies in the conservation and restoration of channel function and value. The methodology can be used to monitor the number of secondary channels within the LMR to demonstrate compliance with the USFWS 2013 Biological Opinion on the MR&T Channel Improvement Program. Data sets can be used to identify high-value secondary channels for conservation purposes and to prioritize secondary channels for restoration.

Background

Secondary channels provide a variety of habitat types and are highly productive while being protected from commercial navigation traffic. Depending on river stage and connectivity, secondary channels function as wetlands, isolated backwaters, connected backwaters, isolated secondary channels, and flowing secondary channels. Connectivity also affects substrates, water quality conditions, benthic invertebrate communities, and fish faunas. However, many secondary channels have closing dikes and sandbars that prevent connectivity at mid to low river flows. Altering these blockages to create a diversity of flow and connectivity improves habitat diversity and provides aquatic species access to high-quality habitat. Diversifying secondary channels by notching closing dikes and monitoring the evolving geomorphology of island complexes is a primary conservation measure within the 2014 Conservation Plan for the Interior Least Tern, Pallid Sturgeon, and Fat Pocketbook Mussel. This atlas can be used as an important resource for these purposes.

Techniques

One set of bathymetric and photographic data for each decade from the 1960s to 2000s was gathered from the New Orleans (MVN), Vicksburg (MVK), and Memphis (MVM) Districts. A secondary channel was defined as a contiguous lower elevation area divided from the main channel by a vegetated or nonvegetated bar. Bars were identified by locating at least three adjacent bathymetric transects (approximately 1,000 ft intervals) with adjacent points whose elevations were $\geq$ +5 ft Low Water Reference Plane (LWRP). An outline of the secondary channel was digitized for the following: inlet and outlet – drawing a line halfway between and parallel to the last bathymetric transect for the bar and the subsequent transect with no bar; riverward bank – connecting the bar's highest elevation points; and landward bank – a line drawn through the first bathymetric point > +10 ft LWRP or just beyond if < + 10 ft LWRP. A secondary channel was no longer present when bathymetric data covered the area where the channel existed in prior or subsequent decades and (1) all data were less than +5 ft LWRP (bar eroded) or (2) a bar existed but at least two transects in the channel had no point lower than +10 ft LWRP. Fifteen riverbed models were generated from the bathymetric data, one model for each decade and district. Secondary channel outlines and riverbed models were used to calculate secondary channel area and volume at water surface elevations of -5, 0, +5, +10 ft LWRP. Because presence/absence and area and volume are determined primarily by the availability of bathymetric survey data, this study includes a subset of LMR secondary channels. Long, shallow secondary channels and those situated within the batture (e.g., old chutes, cutoffs) are likely to be excluded from this study because survey boats could not gain access. This report presents data and a visual atlas (example follows) for each of the 198 secondary channels identified in the LMR.

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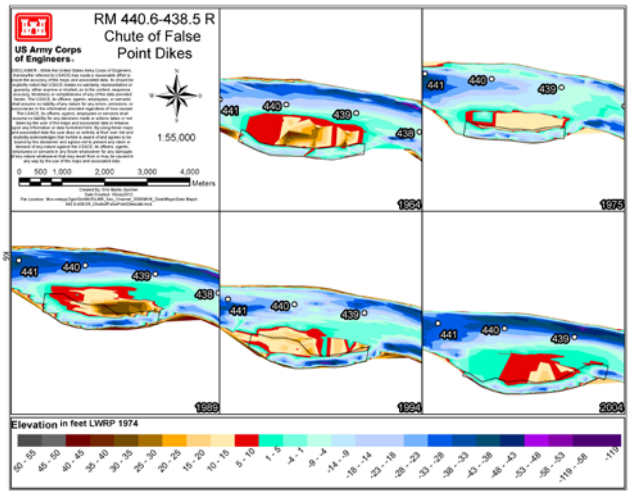
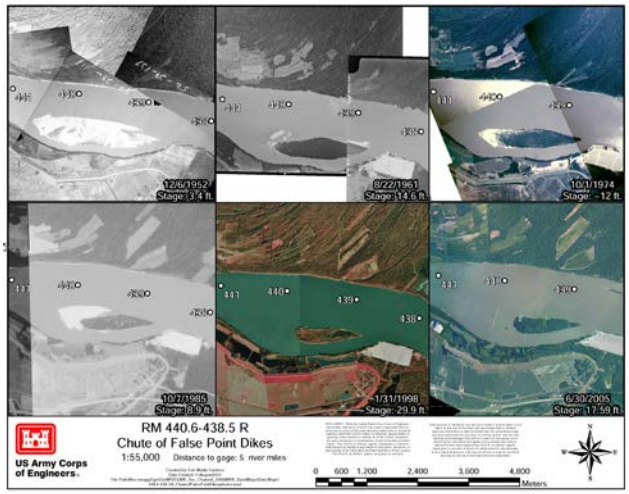
Results and Findings





Decadal data indicate that natural secondary channel formation still occurs within the LMR, albeit due to in-channel development rather than overbank flows. Over 5 decades, 100 secondary channels were identified in MVM, 76 in MVK, and 22 in MVN. Of these 198 channels, 102 had data for 4 of the 5 decades (the 1980s included few channels due to low water). These data can be used to provide insight into secondary channel condition, abundance, and distribution. Restoration efforts can focus on channels with the largest declining area and volume. Alternatively, reaches of river with few channels can be targeted, and existing channels given priority or channel creation sites identified. By studying the large-scale distribution of secondary channels, planners can understand characteristics that lead to channel persistence and focus on sites with these characteristics. Finally, secondary channel habitat types could be classified to focus restoration on channels containing rare habitats. This report provides information that the numerous interested parties can utilize to prioritize objectives and identify restoration sites.

Summary of Significant Findings

- Secondary channels continue to form naturally within the main channel. No overbank formation was observed.
- This study provides a 5 decade snapshot of the number and physical characteristics of 198 LMR secondary channels.
- Re-establishing a diversity of secondary channel connectivity is a priority for USACE partners and a conservation measure in the 2014 Conservation Plan.
- Data can be used to justify and target restoration actions by identifying trends for individual channels or for particular areas of interest.

For More Information

To access the full version of *Change in Lower Mississippi River Secondary Channels: An Atlas of Bathymetric and Photographic Data*, click the following link:

Additional MRG&P reports, historic reports, and MRG&P information can be accessed from the technology transfer section link at the MVD Historic Studies website: http://www.mvd.usace.army.mil/mrgp_pubs.

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