

Lower Mississippi River Basin LTAR, Oxford, MS

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The Lower Mississippi River Basin (LMRB) - comprising portions of Louisiana, Mississippi, Arkansas and Missouri - is the gateway to the Gulf of Mexico and home to some of the most intensively developed irrigated agriculture in the United States. Water quality and quantity are therefore central long-term issues for the Lower Mississippi River Basin. Membership in the LTAR network is led by the National Sedimentation Laboratory located in Oxford, MS in cooperation with four other ARS locations across the region. Research locations within the LMRB together combine research spanning agro-ecosystem dynamics including crop development, cultivation practices, and environmental impacts with existing long-term datasets.

Two research watersheds operated by the National Sedimentation Laboratory form the core infrastructure for the LMRB: Goodwin Creek Experimental Watershed (GCEW) and Beasley Lake Watershed (BLW). The GCEW is a 21.3 km² watershed located within the highly erodible loessal uplands of the Lower Mississippi Valley, where rainfall is plentiful (1360 mm yr⁻¹) and channel slopes relatively steep (0.004 m/m). Fourteen supercritical flumes, constructed in the main channel and tributaries, serve as both grade control structures and gauging sites for runoff, sediment transport, precipitation, and water quality with data collection beginning in 1981. The data set also includes in-channel parameters and cross-section geometry, hydro-meteorological data, land use and management records, nutrient concentrations, and ecological response to stream restoration. The watershed is also home to two NRCS soil Climate Analysis Network (SCAN) stations (pasture, forest) and one NOAA Solar Radiation Budget Network (SRBN) measuring station.

The BLW is an 8.5 km² agricultural watershed located within the Mississippi River Alluvial Valley, within which Beasley Lake is an oxbow lake remnant from the adjacent Sunflower River. Agriculture in the watershed has transitioned from primarily cotton monoculture to a mixture of row crops, with sections of land being enrolled in the Conservation Reserve Program (CRP) in 2003-4 and 2006. Edge-of-field best management practices were implemented in 1994 and monitoring of lake water quality and soil resources assessments have been undertaken by the ARS to the present day. The USGS sampled runoff 1994-2004 and rainfall 1996-1999 and NRCS SCAN presently monitors soil moisture and temperature, precipitation, wind and solar radiation.

The Lower Mississippi River Basin LTAR will also develop long-term research data sets with cooperating USDA-ARS research locations in the region including the Delta States Research Center (Stoneville, MS), Dale Bumpers Rice Research Center (Stuttgart, AR), Delta Water Management Research Unit (Jonesboro, AR), Delta Research Center (Portageville, MO), and the Sugarcane Research Unit (Houma, LA).

Principal research emphases in the LMRB related to the LTAR network include:

1. Evaluating conservation management effects on row crop production and the movement of water, sediment, and nutrients.
2. Quantifying impacts of climate change on regional water availability and quality
3. Developing practices for sustainable water and nutrient management
4. Developing practices to enhance the use of ecosystem services in agricultural production.