Upper Mississippi River Basin LTAR, IA, MN, and WI

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Intense agricultural production in the Upper Mississippi River Basin (UMRB) causes inherent environmental problems, including nitrate export to the Gulf of Mexico, eutrophication of lakes, soil erosion and greenhouse gas emissions. This Long-Term Agro-Ecosystem Research station consists of a distributed network of research sites, including five watersheds: the South Fork of the Iowa River, Walnut Creek N (Story Co., IA), Walnut Creek S (Jasper Co., IA), Chippewa River in west-central MN, and The Pat's Creek – Galena River watershed in southwest WI. Ancillary field sites are available to support research relevant to agricultural systems.

The UMRB LTAR generally lies within the Prairie Peninsula domain of the National Ecological Observatory Network (NEON), the 07 HUC, and the Heartland Farm Resource Region. The UMRB LTAR boundaries coincide with the NRCS boundaries of the Upper Mississippi River Basin. The UMRB LTAR also utilizes existing ARS GRACEnet and REAP sites in Minnesota and Iowa, which address greenhouse gas exchanges and renewable energy issues.

Long-term research (LTR) should focus on the exchange of nutrients, carbon, water and gasses among ecosystem components. In addition, LTR should address soil organic matter structure and composition in relation to biodiversity of crops, animals, and soil biota. Agricultural systems are designed to produce food and fiber that is exported outside the ecosystem, while receiving substantial inputs of energy and nutrients from external sources. This LTAR is developed with the goal of integrating information across a range of locations and partners to address these complex research questions through the development of an interactive multidisciplinary and multiscale network.

Principal research emphases related to LTAR include:

1. Determine how do cropping systems that include perennials, longer rotations and integrated systems of crops with livestock on the land affect soil fertility and in turn water infiltration, water storage in the soil profile or loss to tiles and runoff.
2. Evaluate the water quality improvements gained from new conservation practices for tile-drained landscapes.
3. Evaluate the economic trade-offs among production systems and conservation practices.
4. Determine watershed hydrology and water quality responses to changes in climate and agricultural practices?
5. Evaluate the effect of conservation practices on the fluxes of carbon, water, and nitrogen and water quality.
6. Estimating ecosystem services.
7. Relationship of landscape structure (topography, vegetation, land use) and the up-scaling of soil and aquatic processes to a regional level.
8. Determine the key indicators for defining resilience and stability of an agroecosystem. What are the critical factors controlling resilience and stability?