Platte River – High Plains Aquifer LTAR Network

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The Platte River – High Plains Aquifer (PR-HPA) LTAR network is a partnership between the Institute of Agriculture and Natural Resources at the University of Nebraska-Lincoln (UNL), the USDA-ARS Agroecosystem Management Research Unit (AMRU) in Lincoln, and the USDA-ARS Environmental Management Research Unit (EMRU) in Clay Center. Current emphases are on addressing present-day and emerging issues relating to climate variability and change, water sustainability, and ecological and agronomic challenges associated with the production of food, feed, fiber, and fuel stocks needed by society, while securing a high quality of life in rural and urban communities, as well as maintaining or improving ecosystem services including productivity, biodiversity, air, water, and soils.

The PR-HPA network encompasses 277.5 km^2 (27,750 ha) of research sites with data going back to the early 1900s. A partial list of on-going research projects include those encompassing long-term manuring and continuous corn (Est. 1912), dryland tillage plots (Est. 1970), tillage and crop rotation (Est. 1976 & 1979), soil nutrients and tillage (Est. 1983), biofuel feedstock studies (Est. 2001), Sandhills ecology and vegetation dynamics (Survey sites est. 1926; 1997; 2001; 2010), and grasslands fire, grazing, and mowing (Est. 1981). LTAR- affiliated faculty, stakeholders, state and federal agencies, and networks contribute directly to the implementation, and successful accomplishment of a suite of detailed and specific research objectives. Affiliated partners include the National Drought Mitigation Center (NDMC) that develops measures to improve preparedness and adaptation to climate variability and drought; the High Plains Regional Climate Center (HPRCC) that coordinates data acquisition from over 170 automated weather stations and around 50 automated soil moisture network across NE and beyond; the AMERIFLUX and NEBFLUX networks that coordinate the water vapor and carbon dioxide flux measurements across NE with emphasis on rainfed and irrigated crop lands; the NEBHYDRO network that provides spatial online tools for hydrologic information and analysis; the ARS Greenhouse gas Reduction through Agricultural Carbon Enhancement network (GRACEnet) and the Resilient Economic Agricultural Practices (REAP) project; and the Center for Advanced Land Management Information Technologies (CALMIT) that assists with the use of geospatial technologies for agriculture and natural resource applications. In addition, the PR-HPA network will be able to leverage related activities taking place at the Daugherty Water for Food Institute, the Rural Futures Institute, and the Data Research Center at UNL, as well as emerging federal initiatives such as the USDA Climate Change Hubs and the Department of Interior Climate Science Centers.

Principal research foci of the PR-HPA LTAR network include:

- Sustainable use of the High Plains (Ogallala) Aquifer, focusing on water discharge and recharge, ground and surface water interactions, water quantity and quality.
- Sustainability and resiliency of forests, grasslands and agroecosystems under climate variability and change, and anthropogenic management.
- Sustainable development and resilience of rural and urban communities under growing needs for ecosystem services including water, food, feed, fuel and fiber.
- Agroecosystems resiliency, thresholds and shifts: mitigating and adapting to climate variability and change.
- Role of technology, adaptive management and education in mitigating and adapting to climate change.
- Biological, ecohydrological and biochemical processes in grasslands, forests and agroecosystems under climate variability and change, vegetation cover change (including invasive species) and human activities.
- Water vapor and carbon dioxide fluxes in natural and agroecosystems.
- Close-range, field, and airplane based phenotyping using hyperspectral imaging systems to evaluate natural and agroecosystem productivity, processes, cover and vegetation shifts in response to environmental conditions and management practices.
- Data integration, testing, scaling of models from grid to macroecosystems.