

## Central Plains Experimental Range LTAR, Nunn, CO

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The Central Plains Experimental Range (CPER) has served as a key research site for livestock grazing and rangeland ecosystem dynamics/structure in the western Great Plains since it was established in 1937. The CPER exemplifies ongoing challenges faced by semiarid rangelands around the world to simultaneously manage for both ecosystem goods (e.g., livestock production) and services (e.g., biodiversity, wildlife habitat, carbon storage, greenhouse gas mitigation, hydrological functions) in a changing climate. Our current conceptual framework views climate, disturbance regimes, and physiography as the key interacting factors that structure population and community processes, and influence ecosystem productivity, states and services. Current research experimentation is addressing production-conservation issues and associated tradeoffs with beef production when other ecosystem services are incorporated into management objectives. The CPER has a >70 year history of research on vegetation and livestock including key datasets encompassing: 1) aboveground forage production, 2) livestock weight gains, 3) climatological data, 4) soil carbon, 5) carbon and trace gas fluxes, 6) rainfall simulation experiments, 7) climate change (elevated atmospheric CO<sub>2</sub> and increased temperatures), and 8) remote sensing with high resolution (<10 mm) aerial images.

The CPER encompasses 62.8 km<sup>2</sup> of shortgrass steppe characterized by domination of C<sub>4</sub> (warm-season), grazing-resistant shortgrasses such as blue grama (*Bouteloua gracilis*) and buffalograss (*Buchloe dactyloides*). Major drivers of livestock and forage production, as well as ecosystem structure and function, include drought, fire and grazing by large and small herbivores. The CPER is located on the western edge of the North American Great Plains, which are characterized by a precipitation gradient from dry areas in the west in the rain shadow of the Rocky Mountains to the wettest areas in the east, and a temperature gradient from cold areas in the northwest to warmest areas in the southeast. Ecologically, CPER occurs at the center of this vast temperature gradient and at the western (driest) end of the precipitation gradient. Additional infrastructural capacity for the CPER is the proximity of the High Plains Grasslands Research Station at Cheyenne, Wyoming. The CPER is a core site for NEON Domain 10 and is located in HUC-2 watershed 10 and the Northern Great Plains Farm Resource Region.

Research at the CPER is associated with National Programs 215 (Pasture, Forage and Rangeland Systems) and 212 (Climate Change, Soils and Emissions). The CPER has a tremendous network of partnerships, both scientific and producer/customer related. The Crow Valley Livestock Cooperative, Inc., the oldest grazing association in the US, has been a collaborative partner since the formation of CPER in 1937. The Forest Service is a key partner with collaborations in research on CPER and the adjacent Pawnee National Grasslands. Colorado State University has been the leading scientific partner since the late 1960s beginning with the International Biological Program and this collaboration extended from 1982 to current with the Shortgrass Steppe Long-term Ecological Research (SGS-LTER) project. In addition to NEON, the CPER is a key site in the following networks: Greenhouse Gas Reduction through Agricultural Carbon Enhancement network (GRACEnet), and the Nutrient Network (NutNet). Current and/or planned research projects involve faculty from the following universities: Colorado State University, University of Wyoming, Texas A&M University, University of California-Davis, Oklahoma State University and University of Northern Colorado, as well as the Natural Resources Conservation Service, Colorado Division of Wildlife, Environmental Defense Fund, and The Nature Conservancy.

Principle research emphases of the CPER related to the LTAR network are:

1. Evaluating effects of management practices on forage and livestock production
2. Determining effectiveness of management and conservation practices on ecological sites
3. Incorporating adaptive management to balance livestock production and provision of ecosystem services in a changing climate