

Leon River, Texas

(An ARS Benchmark Research Watershed, one of 24 CEAP watershed projects.)

Characteristics

The upper Leon River, above Lake Belton, consists of 735,600 ha, predominately in the Grand Prairie MLRA and West Cross Timbers (Fig. B8). The watershed area to be evaluated is 607,000 ha above Gatesville in Coryell County Texas. The area is well dissected with streams. Numerous small flood control dams (exact number unknown at this time) have been constructed in the watershed. Two reservoirs, Lake Leon and Lake Proctor, are located in the watershed. The watershed drains into Lake Belton, a large reservoir that provides domestic water for about one-half million people. Soils in the watershed are divided into two major groups. In the upper portion of the watershed, soils are generally lighter textured with loamy fine sands and sand soils occurring near the streams. In the lower portion of the watershed, soils are finer textured, with clays and clay loam soils occurring most often. About 68% of the land area is either in pasture or rangeland. Agricultural cropland makes up about 10% of the total watershed land area, although this amount is decreasing due to a decrease in peanut production in the area. Forestland makes up 17% of the land area. Mean annual rainfall decreases from east to west, but averages about 800mm per year near the center of the watershed. There are 55 concentrated animal feeding operations (CAFOs) in the watershed, mostly dairy operations or replacement heifers. There are about 66,000 dairy cattle in the watershed. Most of the dairy operations are in Erath County in the eastern portion of the watershed located on tributaries of Resley Creek.

Environmental Impacts

Environmental concerns in the watershed are generally associated with the CAFO units and the management and disposal of animal wastes, and municipal wastewater. Land application of the animal wastes can potentially have many positive aspects, including increasing soil organic matter content with associated increased soil aggregation, water holding capacity, and improved soil fertility. There are potentially problems of over application of waste products with excess application of phosphorus and nitrogen, resulting in excessive nutrient loss in surface runoff, and also the potential of pathogen contamination of surface waters. As a result, the environmental issues of concern and under evaluation are:

1. Water Quality: Runoff contaminated with pathogens and /or nutrients.
 2. Soil Quality: Carbon and nutrient availability and distribution in the soil.
- Changes in soil water holding capacity.

Management Practices

1. Nutrient Management (590)
2. Prescribed Grazing (528A)
3. Brush Management (314)
4. Grassed Waterway (412)

Research Objectives

The objective is to quantify the effects of management practices on soil quality and water quality and quantity. Watersheds with a wide range of sizes (0.5 to 607,600 ha) are being studied to examine scale impacts and transport mechanisms. Paired watersheds have also been established to determine the field-scale effects of selected management practices.

Approaches

The upper Leon River Watershed is a new area for ARS research, and few structures are in place. The U.S. Geological Survey (USGS) has a long history of monitoring flow in the Leon River with records dating back to 1925. Monitoring stations have been operated by the USGS in the watershed, resulting in a nest of sub-watersheds of 68,400, 124,000, and 489,700 ha. These records will be invaluable in developing and evaluating models of the hydrology of the watershed. Instruments for sampling stream flow and for measuring flow from smaller areas will be installed to determine how conservation practices associated with manure and nutrient management impact water and soil quality. A watershed model will be used to evaluate the watershed and potential management scenarios.

Soil Properties: Selected soil properties will be determined for a range of management properties, concentrating on manure management and tillage practices. If possible, properties for a range of management intensity and length of management on similar soils will be determined. In one particular study, recently sampled soil properties will be compared to those of archived soil samples that are over 50 years old. The data obtained will provide a basis for computer simulation modeling and/or to verify model results.

Water Quality: In the Mustang Creek watershed (a subwatershed in the Leon Basin), water quality and quantity are being measured for three 1 ha tilled field plots, two 0.5 ha pasture field plots, and one 17 ha tilled field with previous animal byproduct application. Two monitoring sites (1467 and 5506 ha) have also been installed on Mustang Creek. In addition, two large-scale monitoring sites (approximately 500,000 and 600,000 ha) have been established on the Leon River. At each of these sites, automated samplers are collecting storm data on the following parameters: dissolved nutrients (NO₃-N, NH₄-N, PO₄-P), particulate N, particulate P, and suspended sediment. Grab samples for bacteria and dissolved nutrients are being collected on weekly or biweekly schedule. All data will be used to support the CEAP modeling efforts.

Collaborators and Cooperating agencies and groups

USGS, USDA-NRCS, Brazos River Authority, Texas Agricultural Experiment Station, Texas Cooperative Extension, Texas Soil and Water Conservation Board.



The upper Leon River Watershed location and existing stream gages. County names and major streams are identified.