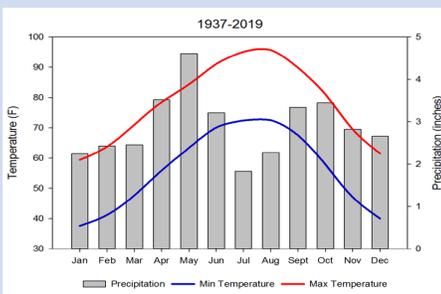


Location

The Grassland Research Station in Riesel, TX encompasses 820 acres of Blackland Prairie. Riesel, TX is the last of three research stations that were opened in the mid 1930s to study soil erosion.

Temperature and Precipitation



Major land uses

Cropland: corn, oats, wheat, cotton, no-till cover crops

Grassland: pasture, hay production, remnant native prairie

Woodland

Data collection

The first runoff samples were collected manually in 1937. Chickasha samplers were used from the mid 1970s to 2001. Automated ISCO samplers were installed in 2001 and are still in use. Flow gauges measure discharge every 5 to 10 minutes. Automated samplers collect water samples during storm events with the addition of manual base flow samples. Measurements of sediment, nitrogen, and phosphorus concentrations in these samples assess water quality. Rain gauges since 1939 and a meteorological station since 1990 measure precipitation, temperature, relative humidity, and solar radiation.

A Conservation Effects Assessment Project (CEAP) Watershed Assessment Study: A collaboration between the Agricultural Research Service and the Natural Resources Conservation Service



Concerns

The soils in the Riesel Watershed are dominated by Houston Black clay soil that is recognized as the classic Vertisol. These highly expansive clays shrink and swell with changes in soil moisture.

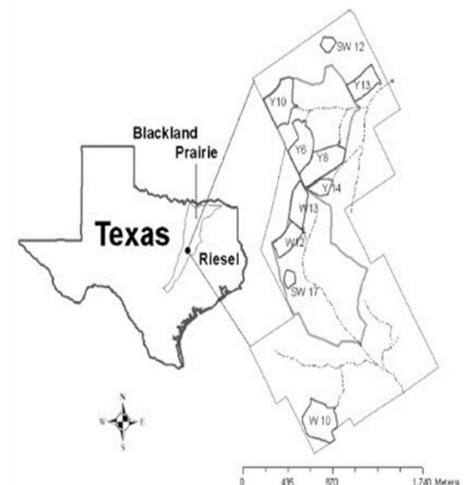
High levels of soil moisture result in decreased infiltration rates, which increase soil erosion. Conversely, low levels of soil moisture result in increased infiltration rates. Preferential flow becomes common when soils dry and large cracks form.

High clay soils can impact crop production. Excessively wet fields can delay planting and in some years prevent planting altogether. During drought, the clay soils in the Blackland Prairie can become so compact that equipment cannot penetrate, making field preparation and planting troublesome. Strategies to mitigate excessive water (e.g., artificial drainage) are largely impractical due to the extensive droughts that are common during the summer months.

Land holdings are typically small, and high variability in crop yields can result in unpredictable profit margins.

Conservation Practices

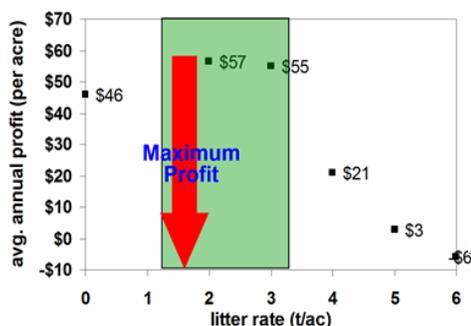
A number of conservation practices are regularly used in the watershed. These practices include broad-base terracing, contour farming, crop rotation, and grassed waterways. Both organic fertilizer (e.g., turkey litter), and inorganic commercial fertilizers (e.g., urea ammonium nitrate, or UAN) are used on conventionally tilled land. Broadcast surface applications of litter or commercial fertilizers are often lightly disked in within 24 hours to incorporate nutrients and reduce losses through runoff or volatilization.



Outcomes/Findings

Plot and Field Scale

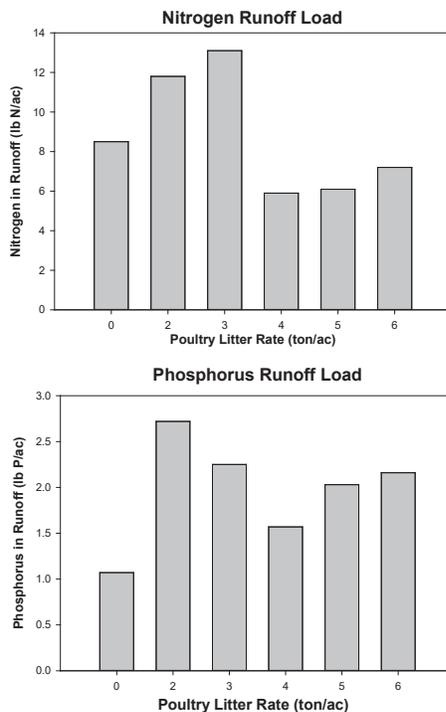
- For cultivated land in the Blackland Prairie region of Texas, litter rates of up to 2 tons/acre are acceptable for maintaining water quality.
- On cultivated land, litter application increased runoff phosphorus (P) but decreased runoff nitrogen (N), particularly at extremely high rates (see charts at right). Litter applications of 3 tons/acre and greater caused P runoff to exceed ideal limits. On pasture, litter application increased both P and N in runoff.
- Runoff N and P concentrations generally decreased during the year as time since fertilizer application increased, but few long-term trends in N and P runoff occurred in spite of soil P buildup due to the dynamic interaction between transport and source factors.
- Litter application had no effect on *E. coli* in surface waters. *E. coli* count was highest in grazed pastures due to cattle. Native prairie had higher *E. coli* in runoff compared to cultivated lands due to wildlife.
- Poultry litter applied at 2 or 3 tons/acre maximized average annual profit, which was greater than with commercial fertilizer. Litter rates above 3 tons/acre diminished return on investment or even caused a net loss.



Riesel Watersheds



Clockwise from left: planting a crop on one of the gaged watersheds, applying poultry litter prior to planting a crop, runoff at a gaging station following a storm.



Watershed Scale

- Conventional practices increased runoff by 56% compared to native prairie. Conservation practices increased runoff by 19% compared to native prairie. Conservation practices overall decreased total runoff, peak runoff, and soil loss. Small grain crops (e.g., wheat) reduced soil erosion compared to row crops (e.g., corn) due to greater soil cover.
- A few intense events (10% of precipitation events) caused more than half of all soil loss via water erosion.

Collaborators and Stakeholders



More Information

CEAP Site Lead: Douglas Smith, Douglas.r.smith@usda.gov
 ARS website: ars.usda.gov NRCS website: nrcs.usda.gov
 CEAP website: nrcs.usda.gov/wps/portal/nrcs/main/national/technical/nra/ceap/