

# National Rangeland Hydrology Study

**Mitch Flanagan**

Of the many values and benefits that come from rangelands, water is becoming increasingly important. Society's demands for improved water quality and quantity requires range managers to have more information regarding the effect of rangeland vegetation, erosion, and soils on the quality and quantity of the nation's water supply.

Complex interactions between soil and vegetation factors influence the hydrologic condition of rangelands. These interactions will not only vary from site to site but also within sites of varying condition. The various kinds of vegetation, plant cover, and soils can be correlated to rates of erosion, infiltration, and runoff. Range

managers need to better understand these relationships in order to achieve the desired water quantity and quality that could result from specific range sites.

## A Cooperative Study

The USDA Soil Conservation Service (SCS) and Agricultural Research Service (ARS) have entered into a cooperative effort to improve the understanding of the plant, soil, and water relationships and to develop data bases and quantitative methods for evaluating rangeland watershed management. Through this effort, the SCS National Range Study Team (NRST) and the Interagency Rangeland Water Erosion Team (IRWET) were formed. The NRST was formed to collect the data while the IRWET, which is comprised of ARS and SCS personnel, was formed to analyze

and integrate the data into Water Erosion Prediction Project (WEPP) technology and appropriate technical and scientific documents.

## Purpose

The purpose of this study is to: (1) determine hydrologic differences of contrasting plant communities on extensive phases of soil series which represent the most important range sites; (2) use the data collected to validate and enhance the WEPP model for rangelands; and (3) develop WEPP parameter data sets for use by the SCS and others.

## Design

The project has been designed to evaluate two or three rangeland plant communities on 15 different soils. Each soil chosen will be represented by a phase of a series which is

Author is range conservationist team leader, National Range Study Team, Midwest National Technical Center, Soil Conservation Service, Lincoln, NE 68508-3866.

*Rainfall is uniformly simulated on a 50 ft diameter area, over two large (3.05 × 10.7 m) plots and two small (0.61 × 1.22 m) plots.*







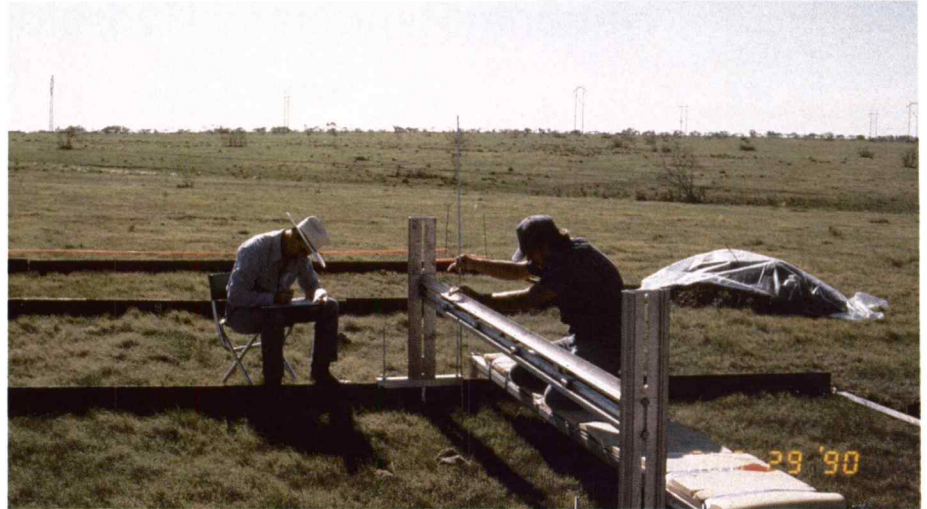
*Complete soil descriptions and soil characterization are completed at each site.*

located in the same landscape position. The study began in 1990 and will be conducted through 1994. The WEPP procedures developed by the ARS are being used to collect the data using a rainfall simulator.

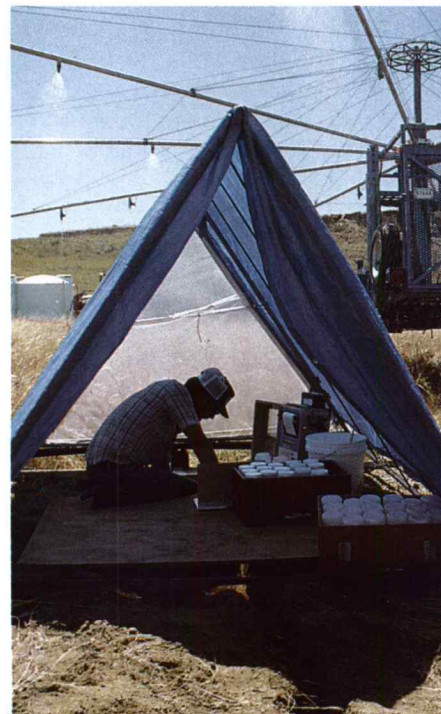
Soil moisture content and bulk density are being collected before and after each rainfall simulation. Soils are completely characterized in one excavated pit to a depth of 150 cm or to the root limiting layer and to 50 cm in four additional pits at each site.

Belowground root biomass is being measured. Soil albedo and soil strength data are being collected. Engineering test data are being collected for the soil surface layer. The National Soil Survey Laboratory and the Soil Mechanics Laboratory in Lincoln, Nebraska, will complete all soils analysis.

The vegetative data being collected consist of standing biomass, leaf area



*Canopy, ground cover, and random ground surface roughness are determined by point sampling with a 49-point frame.*



*Sediment and water samples are collected.*

index, ground and canopy cover, plant heights, canopy diameters, plant shapes, average distances between plants, average plant densities, and plant composition records. The random roughness of the ground surface is also recorded. The hydrologic data include rates of rainfall and runoff and sediment production.

Data have been collected on sites in Nebraska, Texas, Kansas, Wyoming, and Colorado. The NRST plans to spend the 1992 field season collecting data in North Dakota, Wyoming, Idaho, and Arizona. Sites in Colorado, Utah, Nevada, California, and other states are planned for subsequent years.

### Implications

The data collected by the NRST will be analyzed by the IRWET to determine the relationships between the various characteristics of rangeland watersheds. This information will be incorporated into the WEPP model. This model will be used by the SCS and others to provide range managers with reliable information with which to manage rangeland watersheds for increased supplies of higher quality water.