NEW MEXICO
Climate

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Office of the State Climatologist | Department of Agronomy and Horticulture
College of Agriculture and Home Economics | Agricultural Experiment Station

When it rains, it pours ...
Property owners need flood data

Drought is a frequent visitor in New Mexico, and where droughts occur, floods are sure to follow. In New Mexico, rainfall generally doesn't occur in amounts that cause flooding. But floods do occur. When they do, property owners want to have flood insurance if they are in a flood hazard location.

During the period 1979 to 1981, $25 million dollars in damage occurred due to flooding in New Mexico. Flooding doesn't occur in every storm because rainfall events occur in different durations and intensities. Property owners need to be insured against "the big one," or what's known as a *100-year flood*.

A 100-year flood is any flood that will inundate your property and will occur at your location an average of once in 100 years. The 100-year flood has a 1 percent chance of being equaled or exceeded in any given year. So if a rainfall event causes a 100-year flood, there is no guarantee that a flood of the same intensity won't occur for another 100 years. It may happen again the next year, but, *on average*, it will occur only once in every 100 years.

How do you know if a piece of land is likely to be flooded? The city or county government should have information about flood hazard areas. The Federal Emergency Management Administration (FEMA) developed flood hazard boundary maps that delineate the boundaries of communities subject to inundation by a 100-year flood.

Flood insurance is available through private insurance agents, but the insurance is funded by FEMA, which administers the National Flood Insurance Program. When you buy property, the realtor can check with city or county government to determine if the property is within a flood hazard boundary and whether you need to purchase flood insurance.

Each community—city or county—has a flood plain manager who is a member of the New Mexico Flood Plain Management Association. For more information, visit the association's home page on the New Mexico State Climate Center Internet site at http://weather.nmsu.edu/nmfma/. This page also provides Information about the National Flood Insurance program.

Flooded golf course in Albuquerque, New Mexico.

Estimating the 100-year flood

In estimating a 100-year flood, long-term climate data is important. The Cooperative Observer Network, operated by the National Weather Service, collects temperature and rainfall data that is then distributed by National Climate Data Center (NCDC) and state climate programs.

The National Weather Service uses long-term rainfall records to estimate the 100-year rainfall event by generating maps that show how often and how heavy the rainfall events occur in certain places. These maps are known as *precipitation-frequency atlases*, or the NOAA Atlas 2.

Some sites have more than 100 years of rainfall records, while other sites may have only 30 to 50 years of records. The longer the rainfall history record, the better the estimate of the 100-year rainfall event. The Cooperative Observer Network is the only network that gathers weather data in all areas in New Mexico with a long enough history to be used to calculate the 100-year storm event. The NOAA Atlas 2, published in 1973, is being updated to include data collected through 1992.

To develop maps showing flood hazard areas, FEMA used climate data and information about land features as well as the probable course, strength, and height of the flood waters that could occur from a 100-year rainfall event. *—Ted Sammis*

For more information—

- *The NOAA Atlas 2 (precipitation-frequency atlas): http://www.wrcc.dri.edu/pcpnfreq.html*
- *New Mexico Flood Plain Management Association: http://weather.nmsu.edu/nmfma/ Phone: (877) 682-1389*
- *National Flood Insurance program: http://www.fema.gov/nfip Phone: 1-888-CALLFLOOD, Ext. 445*

FYI—

- *FEMA has also initiated the Community Rating System (CRS) to develop flood plain management plans for communities. Action taken under these guidelines will reduce flood insurance premiums.*

Using Weather Data to Estimate Rangeland Carrying Capacity

L. Allen Torell and Kirk C. McDaniel

In coffee shop conversations, you'll often hear this common guideline for stocking rates: "New Mexico rangelands in good condition will carry about 1 Animal Unit Yearlong (AUY)/section (640 acres) for each 1 inch of annual rainfall." Using rainfall data recorded by the National Oceanic and Atmospheric Administration (NOAA) and by traveling many miles to clip and weigh annual grass production, we investigated the validity of this rule-of-thumb. Using data collected over 11 years at rangeland sites near Vaughn and Roswell, New Mexico, we estimated the variation in forage production when annual rainfall patterns were different. What we found was that the rule-of-thumb is *not* correct and it oversimplifies and ignores many important factors that determine an appropriate stocking rate.

In our study, only spring and summer rainfall were found to be important predic-

tors of annual herbage production. This same result was found for similar studies conducted in Texas. This result is not surprising given the warm-season grasses that grow on the blue grama grasslands of eastern New Mexico and west Texas.

Many other factors are important in determining annual herbage production including current rangeland conditions, invading brush species, temperature, rainfall duration, and the frequency of rainfall events. While we did not include in our statistical analysis the detail of rainfall timing and duration, we did find a strong link between the amount of rainfall received during the second (Q2, spring) and third (Q3, summer) quarters and the amount of grass production on an area.

According to our regression analysis, each inch of growing-season rainfall increased desirable forage production by about 42 lb/acre. A base amount of herbage production (230 lb/acre) is included in the model as an intercept; this amount is adjusted up or down depending on growing-season rainfall amounts.

The canopy and production of invading brush species was also found to be an important determinant of annual grass production on New Mexico rangelands. When the overstory of woody species increases, the production of grasses decreases. Broom snakeweed is an important brush species that invades many of New Mexico's best rangelands and it was an important variable included in the regression model. The cyclic invasion of this poisonous weed greatly suppresses the production of desirable forage species and the regression model adjusts predicted grass production downward with increasing snakeweed production on the area.

Using an allowance of 780 pounds of forage per AUM (Animal Unit Month) or 12 times that amount per AUY, the 42 lb/acre of forage produced from 1 inch of added rain increases carrying capacity by 2.9 AUY/section. This is provided forage production exceeds a desired residual forage allowance necessary to maintain rangeland health and to assure satisfactory animal production. Based largely on research conducted in Colorado, this desired residual is considered by many to be about 300 lb/acre for upland blue grama rangelands.

For the plains of eastern New Mexico, the desirable stocking rate is highly variable depending on rainfall and cyclic snakeweed infestations. When snakeweed production exceeds about 275 lb/acre, forage production with "average" growing season rainfall will be less than 300 lb/acre, so there is very little forage available for harvest. Similarly, even without snakeweed infestation, very little forage is available for harvest during prolonged drought periods. For the drought-stricken years of 1994 to 1996, the regression model predicts, and observations in the field confirm, that little if any grazing capacity existed on many New Mexico rangelands. This is in contrast to the wet period of the 1992 to 1993 when grass production exceeded 700 lb/acre on many brush- and weed-free rangeland areas.

Researchers have revised the old rules about rangeland carrying capacity.

Obviously, rangeland carrying capacity is strongly tied to growing-season rainfall; these wide fluctuations in production are accurately predicted by the regression model. Ranchers and range managers can use these equations to predict grass production and stocking rates for current or expected conditions.

Weather data collected from NOAA weather stations was of key importance in quantifying these key production relationships.

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*Allen Torell is a professor in NMSU's Department of Agricultural Economics and Agricultural Business; Kirk McDaniel is a professor in NMSU's Department of Animal and Range Sciences. *This study was published in the* Journal of Range Management *[volume 46(6):506-511, November 1993] under the title "Overstory-understory relationships for broom snakeweed–blue grama grasslands," by K.C. McDaniel, L. Allen Torell, and J.W. McBain.*

About NMSU's Climate Center

NMSU's Climate Center is the office of the state climatologist. The climatologist helps New Mexicans understand the impact of climate changes on the environment, human health, and agricultural production.

The state climatologist is responsible for archiving weather data and distributing climate information to the public. Unlike meteorologists, climatologists do not provide weather forecasting or up-to-the-minute bulletins. Instead, they use a computerized data collection system to provide statewide weather reports for previous days, as well as for historical information.

The office of the state climatologist and its head, the state climatologist, are described in New Mexico Statute 75-4-1 through 75-4-4.

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For more information—

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