

11-773

PACIFIC



SOUTHWEST



FOREST &amp; RANGE EXPERIMENT STATION

Berkeley, California

1965

U. S. FOREST SERVICE  
RESEARCH NOTE PSW-11-773  
80

## Drought on the Bogard Ranger District, Lassen National Forest

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**ABSTRACT:** Three of the five years from 1959 to 1963 were drought years in the Bogard Ranger District in northeastern California. Precipitation records for 28 years from the Bogard area show that (a) drought conditions were present in one-third of the years; (b) drought occurred in about 54 percent of the falls and springs, 36 percent of the winters, and 50 percent of the summers; and (c) in 42 percent of the years at least two of the three main seasons (fall, winter, spring) were dry.

Frequent droughts cause range management problems. The forage supply may fall short of the needs of livestock. Stock water ponds may dry up. Revegetation and plant-control projects may fail. And fire danger is greatly increased. Such problems bother ranchers, whose cattle graze the mountain ranges of the National

Forests, and administrators of these ranges.

Our study of drought conditions deals with the Bogard Ranger District of the Lassen National Forest, about 40 miles northwest of Susanville. Similar amounts and patterns of precipitation may be found throughout much of northeastern California. The information from our study, therefore, has much wider application than just to the Bogard Ranger District.

Severe drought occurred here in 3 of the 5 years from 1959 to 1963. This gave rise to the questions: How often can drought be expected in the Bogard area? Which seasons are most likely to be dry? What are the chances of two consecutive seasons being dry? To answer such questions, we checked precipitation records from the Blacks Mountain Experimental Forest, on the Lassen National Forest, about 12 miles northwest of the Bogard Ranger Station.

The monthly records covered the period from 1935 to the summer of 1960. Individual monthly records were not available for the winters of 1955 to 1957. Records from 1960 to 1963 came from the Champs Flat storage gage maintained by the California Department of Water Resources and from this Experiment Station's

gage at Harvey Valley, on the Lassen National Forest. Both gages are in climatic areas similar to the site of the Experimental Forest headquarters. The few missing monthly records were interpolated from published records<sup>1</sup> of the precipitation in Susanville. The combined records provide 28 continuous years of precipitation data.

### Yearly Precipitation

The mean yearly (Sept. 1 to Aug. 31) precipitation in the Bogard area, based on the 28 years of records, is 18.4 inches (fig. 1). The lowest recorded yearly total, 9.1 inches, occurred in 1938-39. The highest, 36.7 inches, drenched the area in 1955-56.

Hoyt<sup>2</sup> suggested that serious drought effects may occur when precipitation drops to below 85 percent of the long-term average. Stoddart and Smith<sup>3</sup> also used this figure in reference to drought. In using the

<sup>1</sup>Climatological data, California. U.S. Dept. of Commerce, Weather Bureau. 1955-57.

<sup>2</sup>Hoyt, John C. Drought of 1936, with discussion of the significance of drought in relation to climate. U.S. Dept. Interior, Geological Survey, Water Supply Paper 820, p. 2. 1936.

<sup>3</sup>Stoddart, L. A., and Smith, A. D. Range management. Ed. 2, p. 30. New York: McGraw-Hill. 1955.

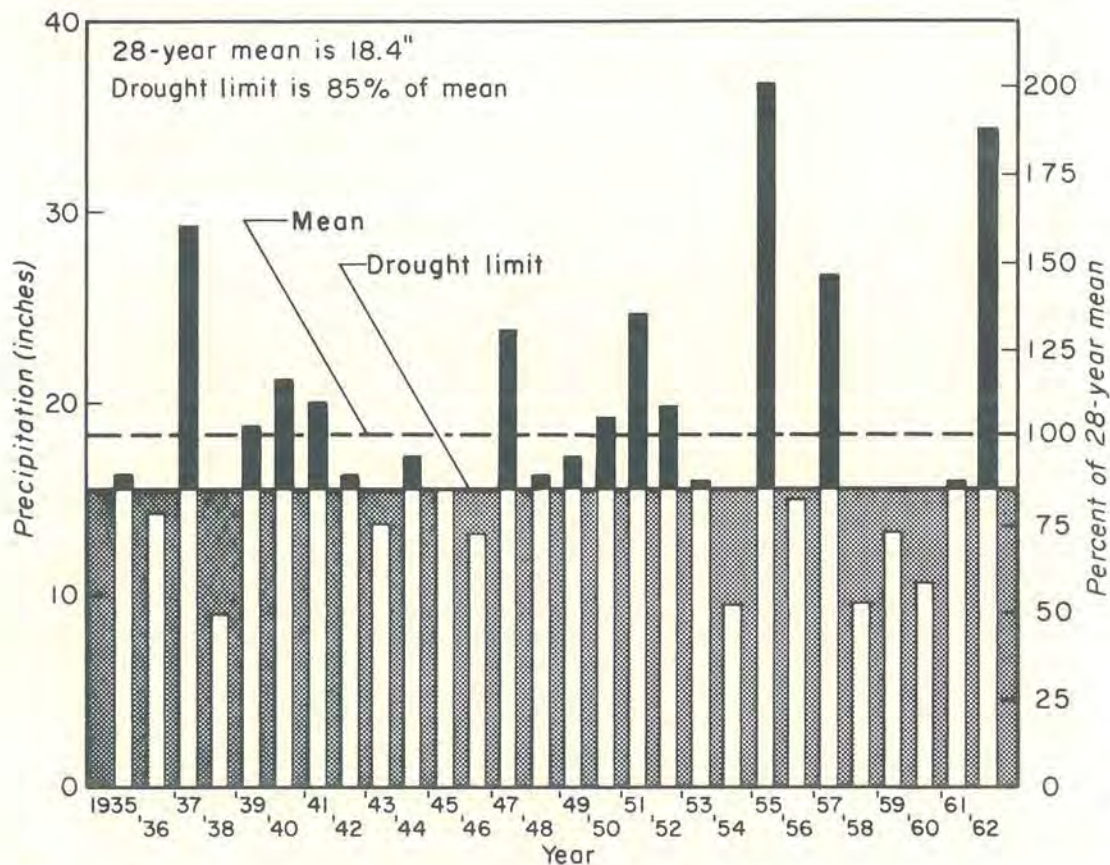


Figure 1.--Total yearly precipitation in Bogard area of the Lassen National Forest 1935-36 through 1962-63.

85 percent figure we found that 10 years or about 36 percent of the 28 years were dry--dry enough to consider that drought conditions existed. This is not an unreasonable percentage of drought years. Stoddard and Smith<sup>4</sup> have reported that over the majority of the West, significantly subnormal precipitation occurs in 20 to 40 percent of the years.

We can expect about one-third of the years to be dry. The other two-third should be near average or better in precipitation.

### Seasonal Precipitation

Distribution of precipitation may be more important than the yearly total in determining the success of forage crops and improvement projects. For this reason we divided the precipitation year into four seasons: (a) fall (September 1 to November 30); (b) winter (December 1 to March 31); (c) spring (April 1 to June 30); and (d) summer (July 1 to August 31).

Twenty percent of the average year's precipitation, mostly as rain, comes in the fall (table 1). Another 20 percent comes in the spring, the growing season. Winter precipitation, mostly as snow, accounts for 57 percent. Less than 3 percent of the average year's precipitation comes in the summer--almost exclusively from infrequent thunderstorms.

Using 85 percent of average precipitation as a measure of drought, we computed the percentages of the years in which this condition prevailed in each of the four seasons (table 1). We can expect about 54 percent of both the falls and springs to be dry. And half of the time summer thunderstorms will provide average or better precipitation. But most of the storms do not produce effective precipitation (1/2 inch or more), and they may come several weeks apart. Winter is least likely to be dry. The chance of a dry winter (36 percent) is the same as for drought for the entire year.

Table 1.--Fall, winter, spring and summer precipitation in the Bogard area of the Lassen National Forest, 1935-1963

Season	Average precipitation	Average part of yearly total	Years season was dry <sup>1/</sup>
	<i>Inches</i>	<i>Percent</i>	<i>Percent</i>
Fall	3.68	20.0	53.6
Winter	10.56	57.4	35.7
Spring	3.66	19.9	53.6
Summer	.51	2.7	50.0

<sup>1</sup>Percent of years season had less than 85 percent of average precipitation.

<sup>4</sup>Ibid.

### Chance of Drought in Consecutive Seasons

The chance of drought in two consecutive seasons is greatest for the summer-fall period. Wet conditions in both winter and spring are more likely than in other consecutive seasons. Dry falls and wet winters have a greater chance, nearly 40 percent, of occurring than any other combination of conditions and consecutive seasons.

If the summer is dry, there is a 40-percent chance that the fall will be wet. But if the fall is dry, then the chance for a wet winter is about 70 percent--nearly 20 percent greater than if the fall is wet. This would likely be a beneficial prospect in the fall-winter period because winter precipitation is especially important after a dry fall.

### Combinations of Four Seasons

All four seasons were dry less than 4 percent of the 28 years. They were all wet about 7 percent of the time. In 14 percent of the years dry falls were followed by wet winters and springs and then by dry summers. This occurred more often than any other combination of seasonal conditions. Although these and the other indications are interesting, many more years of records are needed to determine whether one combination of seasonal conditions is more dominant than the others.

Both fall and spring seasons have been dry in 12 (32 percent) of the 28 years. Winter drought also occurred in 3 of these 12 years. In 42 percent of the years, at least two of the three seasons (fall, winter, and spring) were dry.

### Implications for Forage and Grazing

What do these patterns of drought and precipitation mean to forage production? Precipitation alone does not control the yield of forage. Distribution and form of precipitation, for example, snow or rain, over the year and temperatures during the growing season also have important influences on forage yield. This point is evident when we examine 16 years of forage yield data from the Bogard area reported by Hormay and Talbot<sup>5</sup>. From their estimates of forage yield, it is likely that forage yield in about 25 percent of the years will be "critically low." Using total precipitation, we classed 5 of these same 16 years as drought years. In only 2 of the 5 drought years, however, was forage yield low enough to be critical. Also, forage yield in 2 years was at a critical level when precipitation was above the drought limit.

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<sup>5</sup>Hormay, A.L., and Talbot, M. W. Rest-rotation grazing...a new management system for perennial bunchgrass ranges. U.S. Dept. Agr. Forest Serv. Prod. Res. Rpt. 51, p. 15. 1961.

The winter and spring periods were both dry in the two drought years when forage yield was critically low. Winters were wet the other two poor forage years, and the spring was also wet in one of the years. Before we can have an effective gauge to forage yield, a thorough study of yield in relation to all climatic factors is required.

In some drought years, conditions are so severe that improvement in range health is unlikely regardless of the grazing management system being used. We know, however, that plants in good health stand a better chance of surviving drought than sick ones. Maintenance of good plant health is basic to any system of grazing management designed to improve range health. A plant lost in a drought takes time to be replaced, but a plant saved will produce forage and new plants in the good years.

#### THE AUTHORS

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