

Southwest Watershed Studies of Agricultural Research Service

By

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Water.

Land has no value, agriculturally speaking, without water. It is not the water that falls as rain that gives the value but only that portion which can be used to give plant growth or quality.

In excess of 90% of all the water we use in New Mexico and Arizona for irrigation falls on areas above 8000 feet in elevation and this is only about 12% of the area of the respective states.

Approximately 6% of the water comes from the grassland areas.

High water producing areas mentioned above yield between 15 and 80 percent of their rainfall as streamflow. In the grassland areas this decreases until the yield is only 1 to 3 percent of the rainfall, or in other words, we lose 97 to 99 percent of the rainfall as far as streamflow is concerned. The actual loss to beneficial use is not nearly so high, however, since grasslands of this type generally allow about 50% of the rainfall to infiltrate to the end that it is used to produce forage and other growth which may serve to support animals and hold sediment. Thus the water that enters stream channels may be made more usable also.

Sediment.

Sediment is important because it's movement generally does damage. This damage is centered in three locales. First, the soil from which it originates is left depleted. Second, the paths or channels through which it passes are abraded by it's action. Third, the area in which it is deposited ie. reservoirs, canals, etc. are damaged by losing capacity, burial, etc.

The main sediment producing areas of Arizona and New Mexico are in the grasslands and from stream channels. Approximately 90% of all the sediment originates in these grassland areas while only about 1 percent comes from the high water yielding areas.

Conservation Measures.

The exact effects of conservation measures on water yield and

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sediment production is unknown. Studies on the high water yielding areas by the U. S. Forest Service are beginning to give us some quantitative data for these areas. The low water yielding areas produce such widely spaced flows that any studies here are extra expensive per unit of data obtained. For these reasons, the Soil Conservation Service Research group (now ARS Watershed Hydrology Division) began work on the two great grassland areas of Arizona and New Mexico (blue and black grama grassland). These are the areas where the information is most needed since they are the main grazing areas and they are the areas where present information is most meager.

Some of the questions that need to be answered by this study are as follows:

1. What happens to water yield and sediment production as rangeland improves?
2. What happens to the rain that falls?
3. What is the effect of a conservation program on economic returns to the rancher? What effect does it have on the plant cover and time of water yield?
4. What happens to the water and sediment after they reach established flow channels?

In order to establish a sound program for obtaining these answers a set of criteria which must be met by any watershed selected for study were set up. These were as follows:

1. The area must be between 25 and 75 square miles.
2. There must be adequate control sites.
3. The channel must be of such a nature that channel losses could be measured.
4. The watershed must be tributary to a large watershed used for irrigation and which is gaged.
5. The land owner must be willing to cooperate.
6. The vegetation and soils must be typical of the blue and black grama grasslands respectively.
7. The areas should not be so deteriorated that there is no hope of recovery in a reasonable time.

8. The rainfall must be typical of the blue grama grassland (15-17 inches) and the black grama grassland (10-15-inches) respectively.

9. The areas should be accessible. Roads, trails, etc.

Measurements to be taken are as follows:

1. Soil and vegetation surveys. These include a detailed classification of the density and species of the plants on the watershed and a range-site and condition survey and a detailed reconnaissance soil survey.
2. Sediment source and deposition survey.
3. Rainfall intensity, distribution and amounts.
4. Stream gaging.
5. General cost of livestock operation.
6. Joint planning of conservation practices with the ranchers.

The watershed chosen to represent the blue grama grassland of New Mexico is the upper Alamogordo Creek watershed above the reservoir. Work has begun here and the main control structure is in operation.

The watershed chosen to represent the black grama grassland of Arizona is the Walnut Gulch watershed at Tombstone, Arizona. On this area five flumes were installed and some measurements of stream flow have been made. Both areas have been gaged for rainfall and Soil and range-site surveys completed. The detailed vegetation-soil studies of Walnut Gulch watershed are nearly completed and those for Alamogordo Creek are well under way.

By way of results to date, it can be concluded that rainfall in both areas is extremely variable. For any one season, it is not uncommon to get differences of 500 percent per mile in the total rainfall. While these differences get smaller on an annual basis, they are still very pronounced.

"Unusual" storms have occurred on both watersheds as far as intensity and frequency are concerned. It is our opinion that at least to a considerable degree this phenomenon is due to such poor coverage by gages in the past.

Because of the big demand for data of this kind in construction of roads, flood control structures, etc. the study has been very productive to date even though neither watershed is in full operation.

OUTLINE

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- A. Procedures for resolving interstate water controversies
- B. Legal basis of interstate compacts
- C. Compact mechanisms for establishing equities

II. Reviews of New Mexico's interstate stream compacts

- A. Colorado River Compact of 1922
- B. Upper Colorado River Compact
- C. LaPlata River Compact
- D. Costilla Creek Compact
- E. Canadian River Compact
- F. Pecos River Compact
- G. Rio Grande Compact

III. Conclusion

- A. Effects of Compacts
 - 1. Delay due competition
 - 2. Delay due litigation