

Stockwater Development to Enhance Benefits of Brush to Grass Conversion

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In the western United States, approximately 45 million acres of land are classified as pasture or rangeland used primarily by livestock grazing and wildlife habitat. Of this area, only 9 million acres are classified as good condition. On much of the remaining land, improper management has caused brush to invade previously good grasslands. One of the quickest and, perhaps, the most economical methods used to restore the animal productivity of this land is to convert undesirable brush to desirable grass and forbs.

The conversion of brush to grass may change the hydrologic relationship between precipitation and runoff. This may prevent the full utilization of the potential of the treatment, as illustrated in a study on a brush-dominated sub-watershed within the Walnut Gulch Experiment Watershed near Tombstone, Arizona. This area, typical of thousands of acres of deteriorated semiarid rangeland throughout southern Arizona, New Mexico, and northern Mexico, had a grazing capacity of about 2 animal units (AU)/mi²/year. The vegetative cover was over 80% small brush, primarily whitethorn (*Acacia constricta*), creosote bush (*Larrea divaricata*), and tar bush (*Flourensia cernua*). Animal drinking water within a 1 mile radius of the study area was a 10 ft deep, 5 ac-ft water capacity earthen stocktank at the subwatershed's drainage outlet. Annual precipitation in the area averages 11 inches, with about 2/3 of the total occurring during the summer thunderstorm season (June

through September). Surface runoff into the pond occurs only during the thunderstorm season and is variable in both quantity and frequency. Because of the variable watershed runoff and high seepage and evaporative losses from the pond, the performance of the stockpond as a watering facility was marginal. Because of the limited success of the stockpond and the uncertainty in the hydrologic effects of the rootplowing and seeding, a water-harvesting system was designed and included in the range renovation plan.

In June, 1971, the watershed was fenced to control grazing and then root plowed on the contour. It is common practice to seed immediately after root plowing. However, it was necessary to delay seeding until July, 1972. Because of seed availability, 80% of the area was seeded, using a rangeland drill, to sideoats gramma (*Bouteloua curtipendula*) at a rate of 7 lb/acre. The remaining area was broadcast-seeded to blue grama (*Bouteloua gracilis*) at a rate of 5 lb/acre. The cost of the root plowing and seeding was \$40/acre, or about \$4,000 for the entire watershed. Three years after seeding, the dominant vegetation of the watershed was grass, comprising about 85% of the total cover.

The water-harvesting system consisted of a 10,000-ft² catchment apron covered with an asphalt-fiberglass membrane, a 5,000-gallon closed-storage tank, and a float-valve controlled drinking trough. The catchment site was cleared of vegetation with a road grader, and soil sterilant was spread on the soil surface and wetted into the soil. Fiberglass matting, supplied in 3-ft wide rolls, was unrolled across the catchment, lap-joined, and then saturated with an asphalt emulsion. Two weeks later, a sealcoat of roofing-type asphalt-clay emulsion was spread on the asphalt-

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Revegetated watershed with water harvesting system.

fiberglass membrane. The water storage tank and drinking trough were obtained through military surplus at no cost; the total construction cost was less than \$1,500. If the water storage tank and drinking trough had been purchased, the total system cost would have been about \$4,000.

A grazing study was initiated in the early spring of 1975 to determine the effect of brush to grass conversion on the area's grazing capacity. Twenty-two Hereford cattle grazed 80 acres of root plowed area for two months, which is equivalent to 29 AU/mi²/yr, and over 10-times greater than pretreatment carrying capacity. In the spring of 1976, 24 cattle grazed the same area for a two-month period, equivalent to 32 AU/mi²/yr. Vegetation composition measurements made during and after the grazing periods indicated no significant changes in composition or percent cover.

After treatment, rainfall-runoff results indicated that for each inch of rainfall the watershed was producing only 0.02 inch of runoff, or about 20% of the pretreatment water yield. Associated with this runoff reduction was an almost 50% reduction in sediment yield. Before treatment, the brush-covered watershed was producing about 185 tons of

sediment per inch of summer rainfall. After treatment, the sediment yield was 99 tons per inch of summer rainfall. Obviously, from the 10-fold increase in animal carrying capacity and the 80% reduction in runoff previously used for livestock water, the usefulness of the water-harvesting system becomes apparent.

The water harvesting system can produce about 5,000 gallons of water for every inch of rainfall or, if storage were available, about 55,000 gallons of water a year. Though this does not make up for the decrease in stock pond water caused by the brush to grass conversion, it does provide a more reliable water source. This is because the water-harvesting system will produce runoff from a larger percentage of the rain storms occurring throughout the year, whereas the watershed will produce runoff only during the larger, more intense, summer thunderstorms.

The 10-fold increase in animal carrying capacity and the 80% reduction in runoff previously used for livestock water demonstrate the usefulness of the water-harvesting system as an inexpensive means to supply water to cattle for better utilization of the brush to grass conversion. ●