

# RAINWATER COLLECTION FOR STOCK ON ARIZONA RANGES



Cool, clean water—for range cattle. This watering trough is fed by gravity flow from a cistern.

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There are approximately two million acres of rangeland in Arizona. Although most of this is grazed to some extent, a large portion is inadequately provided with water for livestock. One of the more important reasons for this is the economic unfeasibility of providing water from wells, springs, streams, or tanks.

When runoff water collecting in a storage basin or cistern must be relied on, percolation and evaporation losses should be kept at a minimum. One way to do this is by paving the drainage area and collecting the water in a watertight cistern. Although this general method has been used since Biblical times, surprisingly little use is made of it today.

In order to test the feasibility of this type of structure, a small area was paved and the water collected in a cistern on the Page-Trowbridge Experimental Ranch near Oracle in Pinal County. Precipitation in the area averages 14 inches per year, about half falling during the summer and half in the winter.

## The Collection Area

A triangular area 100 feet on a side was cleared of vegetation and bladed to a smooth surface. An asphalt-water emulsion was mixed with river-run sand on the scraped area. This was then spread to a uniform depth and compressed with a small hand-pushed roller to a final thickness of one to two inches. The surface was finally top-dressed by spraying with asphalt. Later, an 8-inch border was thrown up to keep outside water and debris from washing onto the pavement.

## Cistern Volume

The cistern, which was located immediately below the runoff area, was of poured reinforced concrete—capacity of 29,700 gallons. A sheet-aluminum roof sloping to the center was added to keep evaporation at a minimum and to keep out small animals.

Paved runoff-collecting structures offer certain advantages over wells as a source of stock water. The cost can be calculated in advance for the size of structure desired and there is no possibility of ending up with a "dry hole." Secondly, although precipitation cannot be predicted, there is a good correlation between precipitation and forage production. As



Paved runoff plot 4 years after construction. Roofed cistern at far end.



a consequence, in those years when little water accumulates in the cistern there is also little forage produced. Obviously the reverse is also true; years of maximum forage production will tend to be years of maximum water storage.

A surprising amount of water may be collected from a rather small paved area. In this study, for example, a surface only 100 feet on a side was paved, yet this had a total surface area of 4330 square feet. If one inch of rain fell on this pavement, all of which ran into the cistern, 361 cubic feet of water or 2700 gallons would be stored. Two inches would provide twice this amount or 5400 gallons. Similarly, 4 inches would yield 10,800, 6 inches 16,200 and 11 inches 29,700 gallons or full capacity of the cistern.

## Carrying Capacity Determines

The size of both paved area and the cistern will be determined primarily by the carrying capacity of the range the development will serve, the length of the grazing season, and the character of the

precipitation pattern. Assume, for example, that water will be provided for stock ranging out for 1½ miles in all directions: an area of about 7 square miles. At a stocking rate of 10 head per section, water will have to be provided for 70 head. Taking 10 gallons per day as the average daily water consumption of range cattle gives a total daily water consumption of 700 gallons per day or 21,000 gallons per month.

As most of Arizona has two rainy seasons, a cistern needs to be large enough to store water for only half the grazing season. An 84,000 gallon tank, therefore, would provide water to allow for four months grazing in the spring and four months grazing in the summer and fall.

The feasibility of providing stock water with structures of this sort should be investigated by the Arizona ranchers who are contemplating new stock-water developments. Paved runoff areas will not be the answer in all situations; in many, however, they should be.