TECHNICAL NOTES

Sand Dams as a Feasible Water Development for Arid Regions

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Abstract

Water development is an important aspect of range improvement, particularly in arid regions. A structure including a masonry dam and a collection field of perforated pipes was covered with coarse gravel and capped with sand to develop a low evaporation water source at a remote location. Animals were permitted access to the collected water at a downstream trough. Following development, previously unused forages were utilized by livestock for the first time.

The development of water resources for livestock and wildlife is an important aspect in range management. Particularly in arid areas of the southwestern United States where the availability of water is a major problem, proper use of rangeland will be more easily attained if there are adequately spaced water sources.

The objective of this paper is to illustrate one technique for developing water in an arid environment. A sand dam type of water development was constructed in 1973 by the permittee and the senior author on the Bartlett allotment south of Bartlett Lake on the Tonto National Forest in Central Arizona. Large areas of this ranch had little or no forage utilization by livestock because of limited water. However, after the installation of two sand dams as water sources, these areas were utilized by livestock for the first time.

The sand dam was constructed in an area of small to medium rocky canyons. Construction was begun with the loose sand and gravel being cleared from a rock bottomed ephemeral stream. A masonary dam, anchored in the rock base, and approximately 1 meter in height was constructed with a 2.5 cm plastic outlet pipe. Numerous lengths of 30.5 cm dia aluminum pipe were used to construct the holding basin (Fig. 1). The aluminum pipe had 1.3 cm holes drilled in its top third about 2.5 cm apart, down the entire length of the pipe. The aluminum pipes were then interconnected with drainage capacity into the plastic outlet pipe.

The aluminum pipe was covered with coarse gravel and small

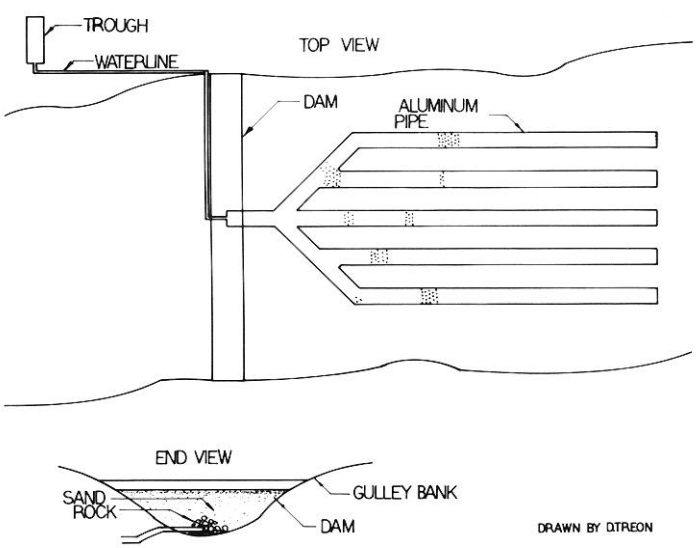

Fig. 1. *A schematic design of a sand dam for harvesting overland flow; its storage and use by animals on arid lands.*

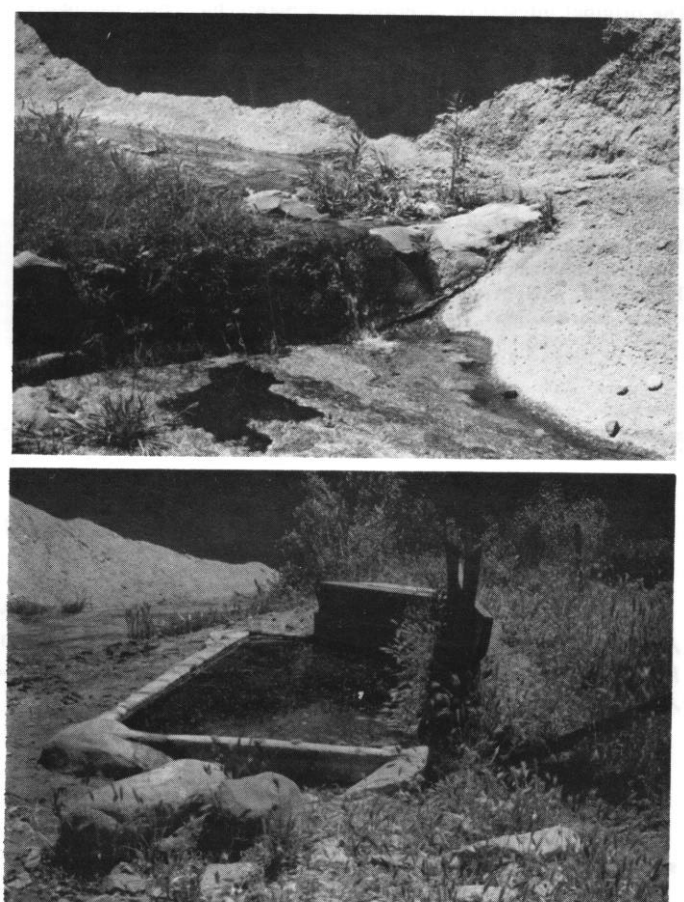

Fig. 2. *A working sand dam on the Tonto National Forest near Phoenix, Arizona. Water is collected in pipes behind the dam (top photo). Water is made available to animals in a trough fitted with a mechanical float value (bottom photo). Photo dates May 3, 1979.*

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Table 1. Storage of water in various size pipes that may be used in a sand dam water development.

Pipe size	Liters per linear meter	Gallons per linear foot
15.2 cm (6 in)	36	2.9
30.5 cm (12 in)	72	5.9
45.8 cm (18 in)	108	8.8
61 cm (24 in)	144	11.7

rocks to a depth of approximately 0.3 m. The water collecting basin was subsequently filled with sand for an overall depth of approximately 1 meter above the aluminum pipes to reduce evaporation from the basin of the level of the aluminum pipe to near zero (National Academy of Sciences 1974) (Fig. 2). The plastic outlet pipe led to a small trough with a protected float valve (Fig. 2).

The volume of water a structure of this type can hold is dependent on the size and length of pipe in the basin and porosity of the gravel and sand. A pipe 30.5 cm in diameter will hold approximately 72 liters per meter of pipe (Table 1). This volume times the total length of the pipe system will give the approximate water holding capacity of the water development. However, the above calculations are only approximate because of drainage from the inlet holes in the pipes.

Since construction, water has been available except during the driest summer periods. Therefore, this development has created a fairly dependable water source where previously there was, at best, only seasonal water.

Sand dams are an inexpensive and resourceful way to store water where it is needed in arid regions. A main advantage of sand dams is their excellent control of evaporation of collected water. Sand dams may be an answer to some of the water problems on rangeland where poor forage utilization results because of limited water sources, as an aid in improving livestock distribution problems. Furthermore, by creating a more dependable water source, sandbars have potential in wildlife habitat improvement.

Literature Cited

National Academy of Science. 1974. More water for arid lands. A report to The Advisory Committee on Technology Innovation, Board on Science and Technology for International Development Commission on International Relations. Washington, D.C. 154 p.