MANAGEMENT NOTES

Water Requirements for Improved Livestock Performance on Rangeland

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Highlight

The close relationship between water intake and animal gains needs to be investigated for beef cattle under rangeland conditions. Water quality and distribution have nutritional implications and may contribute more to the desired level of livestock performance than commonly believed. If true, this would inspire and speed up the development of potential stockwater sources, enhance the benefit-cost ratio of economic considerations, and be useful to range management generally.

Water for livestock use on the western range is taking on a "new dimension." Range managers are giving more attention to the fact that water—like protein, energy or vitamin A—serves a vital role in animal nutrition. In fact, water may well belong in the category of nutritional deficiencies that contribute to poor livestock performance on many areas.

Abundant, well-distributed water supplies should reflect the additional quality of being suitable for livestock to drink. Consideration to water temperature, degree of contamination, accessibility, and frequency of occurrence are important, especially during hot weather when water requirements are high. For example, the Agricultural Research Service has determined that on Southwestern ranges 1,000-lb cattle required seven gallons at 40 F, whereas at 90 F they required 17 gallons/day.[1]

Generally, water consumption is regarded as the greatest limiting factor in cattle feed intake and animal gains. Insufficient water intake adversely affects consumption of dry matter and milk production of dairy cows (Sykes, 1955). Probably beef cows on the range are affected in a like manner to the detriment of young growing calves. Also, to carry a 1,000-lb steer from a maintenance ration to the point of producing maximum gains, the water requirements are almost doubled (Winchester and Morris, 1956). Such studies show that a close relationship exists between water intake, consumption of dry matter, and animal gains.

This would indicate that abundant, clean, fresh water, properly distributed, is one of the key factors in getting good range gains through better cow condition and calf weights at weaning time. This principle is often overlooked in planning water needs for grazing units on a ranch. Also, observations and reports of livestock performance under western range operations do not always express the production capability of these lands because of unfit or insufficient water supplies which actually deter normal gains. More information is needed to determine the effects of plentiful versus inadequate water on milk and meat production of beef cows and on other beef cattle under rangeland conditions.

The task of providing abundant locations of stock water on a range creates major problems, especially where arid conditions are further ag-

[1] *Skovlin, Jon M. 1963. How to improve cattle distribution. Paper presented at Washington State University Range Management Workshop, February, 1963.*

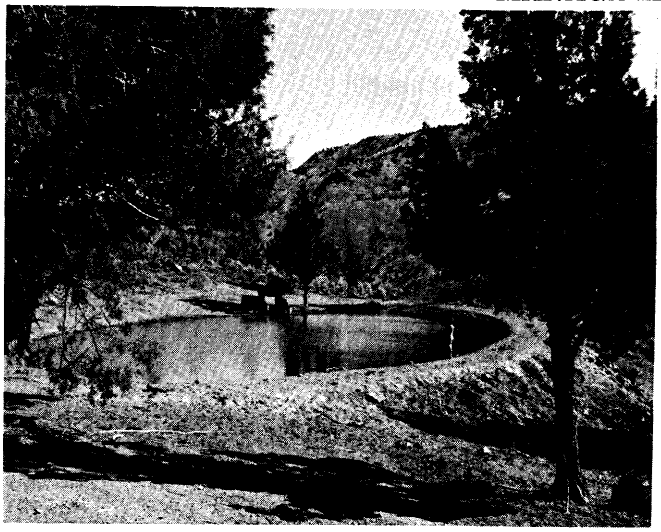

FIG. 1. Spring-fed pond high on Trout Creek drainage, Jefferson County, Oregon, gives livestock easy access to water in rugged country. Warren Friday Ranch, Trout Creek Soil & Water Conserv. Dist.

FIG. 2. A trickle of water from a small spring fills this stock tank. The spring itself is fenced and protected from livestock and the tank rests on firm ground leveled for easy access.

gravated by geologic formations or porous sandy soils which yield little water for livestock use. In other range areas lack of maintenance has caused good spring developments, wells, and ponds to stop functioning properly. Normally these can be rejuvenated to help meet the need for ample water on rangelands (Fig. 1).

Actually, the flow of water required to supply livestock is relatively small. A trickle of 0.7 gal/min is enough water to furnish approximately 1,000 gal/day or sufficient to water about 100 cattle (Fig. 2). Water from a full-flowing 0.5-inch pipe produces about 4.5 gal/min, which is enough to fill eight 750 gal water tanks in one day—more than the daily requirements for 350 cattle, even when allowing 15 gal/head/day.

Covering a small watershed area with impervious material and collecting runoff in a storage tank has been used and is a potential means of getting stock water. One acre-inch of rainfall yields about 27,000 gal of water, which is about six gal for each yd^2 of watershed area. Promising new materials such as butyl sheeting or asphalt-coated liners for ground covers and chemical soil sealants to increase runoff, together with storage equipment to eliminate evaporation and seepage of collected rainfall are becoming available. With water facts such as this, the U.S. Water Conservation Laboratory at Tempe, Arizona predicts that within a few years the cost of harvesting water can be decreased from the present cost of more than $3.00 to no more than $0.36/1,000 gal in areas of about 10 inches of annual precipitation.

Whether or not stock water can be developed or provided on rangeland is based on the benefits derived compared to the cost involved. Some range operators attribute 50% of a pasture's value to its water supply. Some of these values are difficult to assess but nevertheless are real. For example, a range unit may be well suited to summer or fall grazing but a shortage of water necessitates early spring use each year. Such a situation precludes rotation of deferred grazing or some similar forage management practices designed to improve range condition. Also, where watering facilities are too far apart, cattle tend to trail with little or no grazing enroute.

A reasonable investment in stock water commonly is determined by an inventory of the amount and value of forage that would be gained annually if water were provided. A guide to this investment can be computed using standard interest and annuity tables. The procedure involves the principle of capitalization in which the net annual income from the additional forage pays back the capital investment at a rate of interest and in a number of years that are specified (Table 1). For example, a rancher has 500 acres of rangeland which is going unused because of inadequate stock water. A range inventory of the area shows that it produces about 100 AUM's of forage annually. The rancher has determined that one AUM of grazing has a net worth of $3.50 to his operation. (Note that the assessed value of an AUM must be NET since it is only the net income that pays back the capital investment.) He wants to know how much he can afford to spend for livestock water within that 500-acre area in order to properly harvest the forage crop and recover his investment in ten years at five percent interest. By using the capitalized net value of one AUM at $3.50 x 100 AUM's he finds that he can afford to invest $2,703 under the conditions stipulated.

Table 1. Four commonly used grazing values per AUM capitalized at 5% for 10 years.

Assessed Net Value of One AUM	Capitalized Net Value of One AUM[1]
1.50	$11.58
2.50	19.30
3.50	27.03
4.50	34.75

[1] Capitalized Net Value of one AUM=Assessed Net Value x Capitalization factor of 7.72173, which is present value of an annuity of 1 at 5% for 10 years.

LITERATURE CITED

SYKES, JOSEPH F. 1955. Animals and fowl and water. U.S.D.A. Yearbook of Agriculture, P. 14-18.

WINCHESTER, C. F., AND MORRIS, M. J. 1956. Water intake rates of cattle. J. Anim. Sci. 15:722-740.