# Stockwater's Effect on Cattle Performance on the High Desert

**STATION BULLETIN 625**
**January 1977**

*Agricultural Experiment Station*
*Oregon State University*
*Corvallis*

*In cooperation with the*

*Agricultural Research Service, USDA*

# Abstract

Allowing cattle to drink every other day or requiring them to daily trail one to two miles to water reduced water intake 25 to 35 percent of that of cattle with unlimited access to nearby water. Such water intake reductions during the summer grazing season did not cause a permanent weight reduction in yearling cattle. Lactating cows, when similarly stressed, tended to gain weight but their calves showed reduced performance. The calf, after 3½ months of age, showed a strong desire for water and when water was withheld, performed poorly. Forcing animals to trail one to two miles to water every other day did not reduce water intake beyond either treatment alone; it did permanently reduce weight of heifers due to calve in the fall.

There was no evidence that the stress treatment affected the fetuses, calf drop date or weight, or the ability of the heifers to breed. Water intoxication occurred in two yearlings deprived of water for 96 hours.

*Authors:* Forrest A. Sneva, Agricultural Research Service, U.S. Department of Agriculture, Burns, Oregon; L. R. Rittenhouse, Associate Professor, Extension Service, Texas A&M, Vernon, Texas; V. E. Hunter, Research Assistant, Oregon Agricultural Experiment Station, Burns, Oregon 97720. Research results came from cooperative investigations of the U.S. Department of Agriculture, Agricultural Research Service, and Oregon Agricultural Experiment Station, Squaw Butte Experiment Station, Burns, Oregon.

# Stockwater's Effect on Cattle Performance on the High Desert

Forrest A. Sneva, L. R. Rittenhouse, V. E. Hunter

As early as the 1920s, research linked the utilization of forage on semi-arid ranges with the waterhole. By the mid-1940s, it was known that forage utilization on the rolling plains decreased rapidly beyond one mile from the watering point. Based on that information, it is estimated that 40 to 60 percent of the public rangeland in the Great Basin area is inadequately watered for proper utilization of the forage.

It is strange that researchers have not investigated the impact of water stress upon the performance of cattle grazing on summer ranges since it is known 1) that in confined studies of cattle their water and feed intake are linked together, with a decreased intake of one immediately reducing intake of the other, 2) that much of our desert rangelands are poorly watered, and 3) that water is physiologically important to the animal.

These results of prolonged periods of water stress on cow, yearling, and calf performance have been documented from studies conducted at the Squaw Butte Experiment Station during 1969 to 1974. Also documented are findings on the impact of trailing one to two miles to water on the water intake and weight changes of various classes of animals.

The studies were conducted on crested wheatgrass seedings and native sagebrush-bunchgrass pastures, typical of those in southeastern Oregon. Climate and soil conditions at the station, about 4,500 feet above sea level, are typical of the cold, high desert of the northern portion of the Great Basin area. About 12 inches of precipitation are recorded annually, mostly as snow and rain during the winter. The summer season, beginning in July and extending through September, is dry. Long-term monthly temperature and precipitation means for the grazing period as measured at the station's headquarters are:

*Maximum temperature (°F)*

| *April* | *May* | *June* | *July* | *August* | *September* |
|---|---|---|---|---|---|
| 57 | 66 | 72 | 85 | 83 | 75 |

*Minimum temperature (°F)*

| | | | | | |
|---|---|---|---|---|---|
| 29 | 37 | 41 | 49 | 48 | 42 |

*Precipitation (inches)*

| | | | | | |
|---|---|---|---|---|---|
| 0.7 | 1.5 | 1.3 | 0.3 | 0.5 | 0.6 |

The station cattle, a commercial Hereford herd, are accustomed to closely available water and grazing a rolling to moderately rough terrain. Treatments generally contained four to six animals with treatments replicated at least three times. Numbers per treatment were borderline for overcoming within animal variation; however, the closed breeding program over the last 40 years at this station has greatly reduced this component of variation in the herd. While statistical significance was not always obtained, the consistency of the response to treatments over years suggests that such differences were a reliable measure of animal performance under conditions of these experiments. For more detailed information of these studies, see Sneva *et al*, 1973; Rittenhouse & Sneva, 1973; Sneva *et al*, 1975; and Sneva *et al*, 1976.

## Results

### Study 1

Twelve yearlings averaging 560 pounds per head were randomly allotted into three treatment groups and to individual pastures. One treatment

Figure 1. Yearling heifer at water on crested wheatgrass during water frequency study.

group had free access to water, one treatment group was watered once every 24 hours, and the third treatment group was watered every 48 hours for a 90-day period beginning July 8. The average daily gain (ADG) of these yearlings, grazing crested wheatgrass, was 1.22, 1.23, and 0.88 pounds, respectively. For the next 42 days, all animals had free access to water. The mean body weight change was +3, –8, and +22 pounds, respectively. Thus, animals under stress (drinking water every 48 hours) gained more weight when they returned to a normal watering schedule which compensated for the weight loss when stressed for water.

Amounts of water (corrected for evaporation losses), salt, and bonemeal consumed daily per head were:

| *Treatment* | *Water Intake* | *Salt Intake* | *Bonemeal Intake* |
|---|---|---|---|
| | (gallons) | (grams) | (grams) |
| Free access | 9.4 | 99 | 21 |
| Every 24 hours | 8.2 | 70 | 14 |
| Every 48 hours | 6.4 | 46 | 8 |

Yearlings watering every 48 hours reduced their intake of water approximately 35 percent and their mineral consumption even more. Yet this reduction failed to permanently reduce their performance.

**Study 2**

Two mature cows with spring-born calves and two yearling heifers were placed in each of six, 160-acre native range pastures. These six pastures provided three replications of two water treatments. For one treatment, water was centrally located with free access. The other treatment was a two-hour midday access to water every other day (48 hours without water). The trial ran from April 14 through September 10.

Groups of cattle drinking once every 48 hours reduced their water intake by 34 percent. The yearling heifers showed no difference in ADG. Their gains averaged 1.69 pounds a day for the period plus a seven-day recovery period. Cows drinking every 48 hours gained 0.38 pound per day more than cows with free access to water, despite the reduced water intake, but their calves gained 0.51 pound per day less. The gains of calves on the stressed treatment were only slightly larger when the recovery period was included.

**Study 3**

The trailing study was conducted in six, 160-acre native range pastures with trailing lanes. These six pastures provided three replications of two water treatments (Figure 2). Two cow-calf pairs and two yearling heifers per pasture per year were studied for two years. Trials were started in late April or early May and ended in September. Animals were free to travel to water. Salt and salt-bonemeal mix were available at all times.

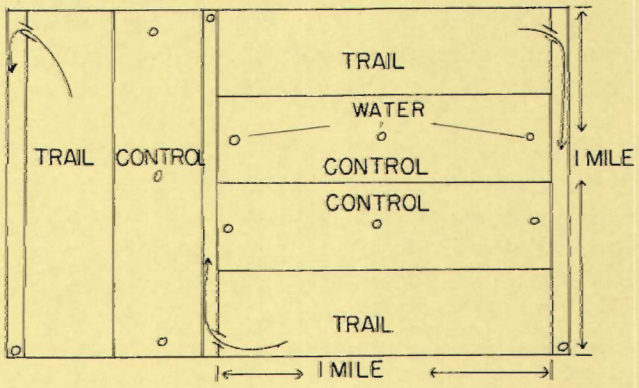


Figure 2. Trailing study pastures layout.

Frequently cattle were observed grazing on the backside of the pastures, two miles from water. Animals having to trail the one to two miles to water did so daily. Most often they trailed in near midday, spent only a short time at water (less than 20 minutes) and returned immediately to the pasture. Animals trailing to water reduced their water intake about 26 percent compared to control groups. This reduction in water intake was about 10 percent less than that of animals drinking

every 48 hours but pastured where no trailing was necessary.

No differences in ADG for cows or yearlings were attributed to trailing. Calf gains were less for the trailing treatments in both years but significantly so only in one. The results again suggest that water intake reductions of 25 percent did not permanently affect performance of larger animals. The data suggest, however, that calves may be more vulnerable to water stress.

**Study 4**

Because of the acute susceptibility by the calf to water stress found in Study 3, 16 matched cow-calf pairs were allotted to individual pastures. In eight pastures, the water tank was elevated so only the dam could get water. In the other eight pastures, both the dam and calf had free access to water. The study began June 1 when the calves averaged 2½ months of age and 184 pounds and the dams averaged 951 pounds.

In the first 30 days, the calves showed little desire for water. This changed rapidly in the second 30 days when temperatures increased, the calves grew bigger, and milk flow was possibly reduced. Calves without water became nervous, stayed near the water, tried to climb up to water, and by the end of July were noticeably shrunk.

In the 60-day period, calves with water gained 0.4 pound per day more than calves without water.

The amounts of water consumed daily by the cow-calf pairs and by the cow alone during four measurement periods were:

| *Period* | *Water drunk (gallons)* | |
|---|---|---|
| | Cow | Cow-Calf |
| June 7-11 | 12.4 | 12.2 |
| June 21-25 | 13.3 | 14.4 |
| July 5-9 | 14.1 | 16.7 |
| July 19-23 | 16.7 | 18.0 |
| Average | 14.1 | 15.2 |

The difference in average water consumed—1.1 gallon/day—is an estimate of the amount drunk by a calf 3½ months old.

**Study 5**

Cattle grazing the semi-arid rangelands usually water at least once a day. Seldom have cattle been observed to drink every other day. Squires, 1973, summarizing water-animal relations in Australia, stated that cattle trailing seven miles to water under daytime temperatures exceeding 100°F had been observed to stay away from water for 36 hours. However, in Studies 1, 2, and 3, cattle drinking every 48 hours (but close to water) or cattle trailing one to two miles to water (but drinking daily) reduced their water intake to a similar degree (25 to 35 percent).

What happens if these two treatments are combined, forcing the animal to trail one to two miles to water every other day? In 1974, four pregnant heifers bred to calve in October were put in each of the six, 160-acre native range pastures. In the three trailing pastures, the gate to the trailing lane was opened every 48 hours at 11 a.m. and closed when the animals returned several hours later. In the three control pastures the heifers had free access to nearby water. The study started in mid-May and ended August 20. Average weight of the heifers was 803 pounds.

The daily water consumed by the control groups was 11.3 gallons/head. Those on the stress treatment reduced their consumption of water 24 percent of that amount. Thus, combining these two stress factors did not further reduce the amount of water consumed during either treatment. Gains of animals on the stress treatment were reduced by 28 pounds/head even after the recovery period gains were included. There was no treatment effect on the calf drop date, weight of calf at birth, or ability of heifers to produce calves.

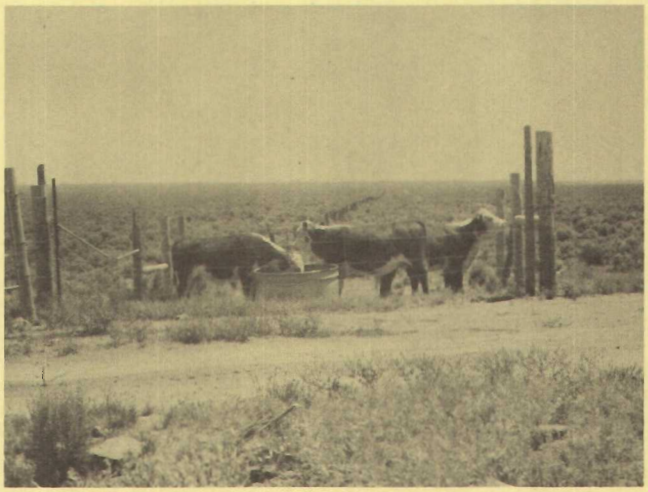

Figure 3. Pregnant heifers drinking at the end of one to two mile trail in 1974.

**Study 6**

Sixteen yearling heifers, averaging 528 pounds/head, were stratified by weight and randomly allotted to individual pastures and to treatments of free access to water or water every 24, 48, or 72 hours. After being conditioned to those stresses,

all animals were subjected to two consecutive periods of 96 hours without water.

Our interests were twofold: can cattle be conditioned to water stress, and how long can animals be without water before they are susceptible to water intoxication?

During July, yearlings drinking every 24, 48, or 72 hours consumed 8.3, 5.5, and 4.5 gallons/head/day, respectively. These amounts were 102, 68, and 56 percent, respectively, of amounts drunk by animals having free access to water. After the 96-hour without water period, water consumption was less than 4.0 gallons/head/day, and less than 50 percent of the usual amount. During the 96-hour period without water animals previously stressed at 48 and 72 hours were considerably more nervous and alert than animals previously accustomed to free access to water, or water every 24 hours, which were listless.

After the 96-hour period, there was no indication of water intoxication during the four hours following drinking. However, the following morning, one animal was down, and another animal was observed to go down twice. Both animals previously had access to water every 24 hours. Separated from the study and treated separately, they recovered.

## Discussion

Results of these studies show important relationships between water intake and cattle performance. It was surprising to learn that, in many instances, a reduction of water intake of 25 to 35 percent over a summer grazing period did not have a significant effect on the performance of mature cattle. This is not the information in cattle management texts. If the reported basic relationship between water and feed intake is correct and the results of these trials are correct, we are still a long way from understanding why reduced water intakes of this magnitude (25 to 35 percent) did not cause reduced ADG in growing cattle.

Results suggest that the suckling calf is most susceptible to water stress. On ranges where the trailing distance between forage and water is excessive, the reduced water intake of the dam is critical to calf performance. A reduced water intake by the lactating dam first curtails the production of milk. The dam, relieved of the high milk-nutrient demands, behaves like a dry cow and gains weight. The calf, still at an age when its growth depends on milk flow and unable to adequately handle range forage which is decreasing

Figure 4. Injecting an electrolytic solution into a yearling down with water intoxication.

in quality, suffers the most and its gains are reduced. Faced with great trailing distances and increasing summer temperatures, the calf is less likely to travel to water. Thus, the calf is hurt in two ways, and the condition of the cow is no indication of how well the calf is performing.

Young, mature animals generally showed reduced gains when forced to trail one to two miles to water or when permitted to drink once every 48 hours. The magnitude of treatment effects rarely was sufficient enough to be statistically significant. In all instances, compensatory gain during the recovery offset weight losses during the trial period. Thus, this class of animals, grazing on eastern Oregon ranges, is perhaps safe from water stress effects that occur normally. However, if prolonged high summer temperatures or muddy, brackish, salty water (which in themselves may cause reduced water intake, Valentine, 1971) are also encountered, reduced performance of economic significance appears likely.

Combining the two treatments (requiring animals to trail one to two miles to water every 48 hours) did not reduce the water intake more than either treatment by itself. This suggests that there is a minimum water level that the grazing animal attempts to maintain.

Animals trailing one to two miles to water generally made the round trip in less than an hour. Research (Talbot, 1926; Glendening, 1944; Valentine, 1947) elsewhere has shown that forage utilization decreases sharply beyond one mile from water on relatively level topography. With today's

need for protecting stream bottoms and areas adjacent to permanent watering holes, is there a place for trailing lanes? Such lanes may be a viable alternative to developing watering facilities away from the current source. On the basis of these results, this management approach could be taken without jeopardizing animal performance if yearling or dry cows were used as the grazing animals.

Some ranchers haul drinking water to certain ranges. Results of these studies suggest that if water locations were fenced for complete control, watering every other day might have merit. This could reduce the water hauled by 25 percent, a considerable saving with no ill effect on performance. Watering every other day, however, should not be done if the herd consists of lactating cows with calves.

When yearling heifers were watered every 72 hours during July, they lost weight but survived. Ranchers sometimes have to make a decision on whether to rough animals through or sell and restock later; generally, the latter course is more expensive. Limiting water intake may get animals through a drought period without serious death losses.

Mechanical failure of water systems is well known to semi-arid area ranchers. Although beef animals can go without water for a considerable time before dying, it is important to know when they become susceptible to water intoxication after water is available. In this study, yearling heifers averaging 528 pounds became susceptible to water intoxication after 96 hours without water. The two animals in Study 6 that developed water intoxication did not show signs of it during the first four hours of drinking. Dehydrated cattle given access to water should be observed more than four hours.

Finally, it is inferred clearly from these studies investigating the effects of water stress on cattle plus information from previous work by others on effects of forage utilization away from water that: If stockwater is provided to assure even utilization of range forage, adequate water will be provided for livestock performance. When we take care of our range, the range will take care of our cows.

## References


Glendening, George E. 1944. Some factors affecting cattle use of northern Arizona pine-bunchgrass ranges. Res. Rep. No. 6, S.W. Forest and Range Exp. Sta. p. 1-19.

Rittenhouse, Larry R. and Forrest A. Sneva. 1973. The influence of selected climatological parameters on water intake of cattle. Water-animal Relations Proceedings. June 26-28. Snake River Conservation Research Center. Kimberly, Idaho.

Sneva, Forrest A., Larry R. Rittenhouse, and Larry Foster. 1973. Stockwater restriction and trailing effects on animal gain, water drunk, and mineral consumption. Water-animal Relations Proceedings. June 26-28. Snake River Conservation Research Center. Kimberly, Idaho.

Sneva, Forest A., Larry R. Rittenhouse, and V. E. Hunter. 1975. Summer grazing performance of cattle as influenced by water stress and trailing. Proceeding. Western Section Society of Animal Sci., Vol. 26:27-28. Fort Collins, Colorado, July 27-30.

Sneva, Forrest A., V. Hunter, and L. Rittenhouse. 1976. Conditioning cattle to water stress. Proceedings. Western Section Society of Animal Science, Vol. 27:240-243. Pullman, Washington, July 19-20.

Squires, Victor R. 1973. Distance to water as a factor in performance of livestock on arid and semi-arid rangelands. Water-animal Relations. Proceed. June 26-28. Snake River Conservation Research Center. Kimberly, Idaho.

Talbot, M. W. 1926. Range watering places in the southwest. USDA Dept. Bull. 1358 p 1-43.

Vallentine, John F. 1971. Range Development and Improvements. Brigham Young Univ. Press. Provo, Utah. pp 403-425.