Considerations for Rangeland and Livestock During Drought

Periodically the Northwest faces a crop year of much less than average precipitation; drought. This circular briefly summarizes data collected by Eastern Oregon Agricultural Research Center personnel. Its function is to describe drought, give insights on how it affects plants and livestock, and provide some management ideas. More information is available from the Station, County Extension offices, and other government agencies.

There is no universally accepted definition of drought. A frequently used definition proposes that any period receiving less than 75 percent of normal precipitation be classified as drought. Past efforts at the Eastern Oregon Agricultural Research Center established that precipitation accumulated from September through the following June is responsible for forage that is produced during any given growing season. Most forage plants have stopped growing by July, and rains occurring in July and August contribute little to forage production. We frequently refer to the September-June period as a "crop year" because moisture from these months is responsible for forage growth. If we look at the crop-year precipitation for the Burns weather station (average precipitation = 10.9 inches), drought conditions with less than 75 percent of average precipitation have occurred during 9 of the last 50 years (Figure 1). The most recent and severe drought was during the 1977 growing season. On the average a drought occurs about 1 out of every 5 years. Fortunately two successive years of drought have not occurred in recent times in eastern Oregon.

Eastern Oregon Agricultural Research Center Circular of Information No. 1. Eastern Oregon Agricultural Research Center is jointly funded by Oregon State University-Agricultural Experiment Station and U.S. Department of Agriculture-Agricultural Research Service. Locations are Squaw Butte Station, HC-71, 4.51 Highway 205, Burns, Oregon 97720 and Union Station, Box E, Union, Oregon 97883. Authors are Raymond F. Angell, Range Scientist, USDA-ARS; Tim DelCurto, Assistant Professor, Animal Nutrition; David C. Ganskopp, Range Scientist, USDA-ARS; Larry Hammond, Biological Science Research Supervisor 1; Richard F. Miller, Professor, Rangeland Resources; Harley A. Turner, Associate Professor, Animal Nutrition; and Martin Vavra, Professor, Animal Science and Rangeland Resources.

GROWING SEASON PRECIPITATION
SEPTEMBER - JUNE

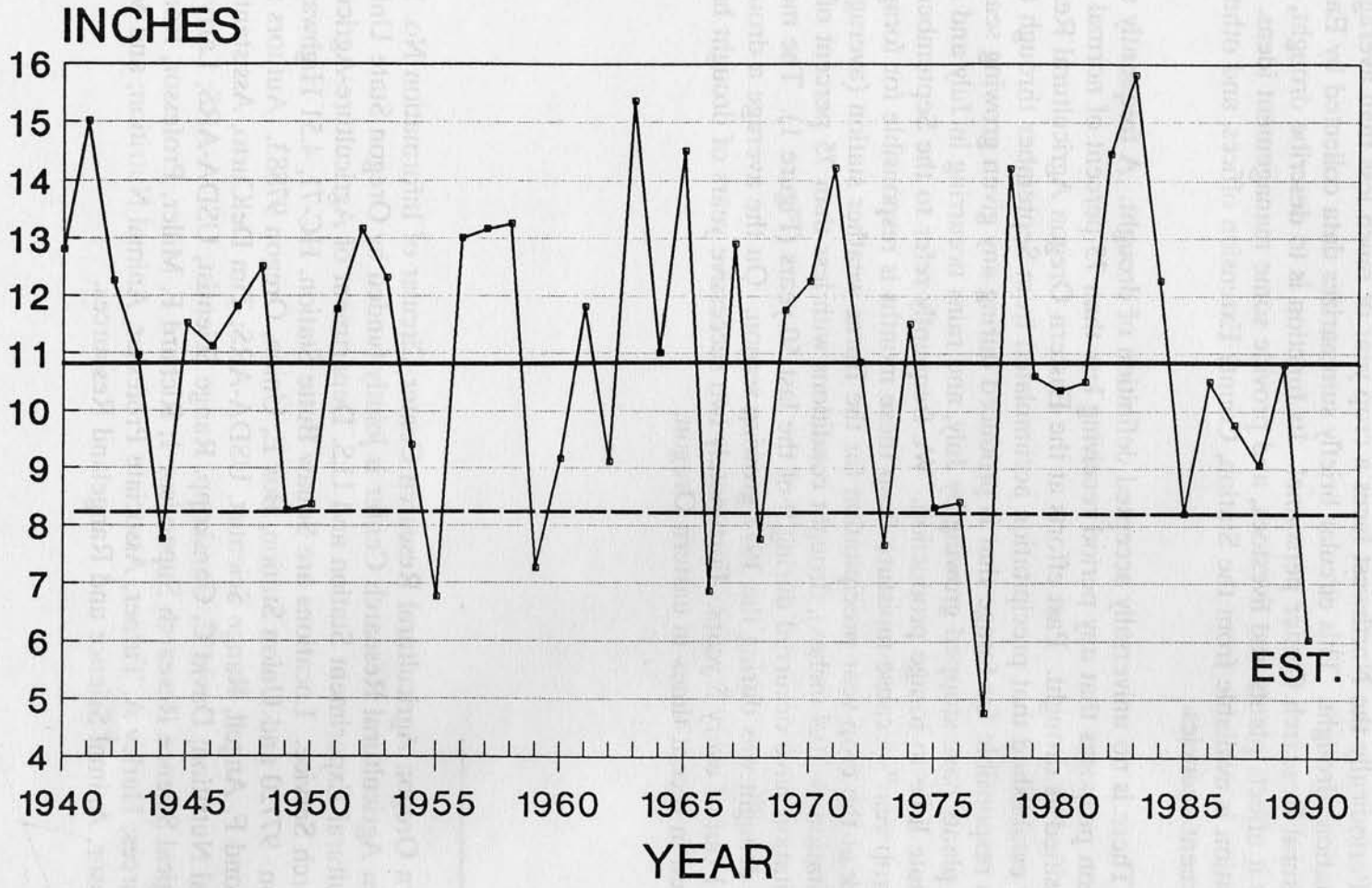


Figure 1. Growing season precipitation (Sept.-June) at Burns, Oregon from 1940 through 1990 (1990 estimated). The solid line (_____) represents a long-term average of 10.9 inches with the dashed line (------) representing 75% of that average, which is considered drought conditions.

Soil Water

Winter precipitation (primarily snow) and the nature of the spring thaw in eastern Oregon influence the amount of moisture stored throughout the soil profile at the beginning of the growing season (Figure 2). The area on the graph lying above line 2 is where soil moisture is plentiful for rapid growth. As soil water content falls between lines 2 and 3, moisture is still available, but demands for optimal plant growth will exceed what plants will be able to acquire from the soil. At this point water begins to limit growth. Once soil moisture falls below line 3, plants will stop growth, with some, such as perennial grasses, going dormant, while others, such as sagebrush, shift into a maintenance mode. In years when the beginning point for soil water is near line 2; forage production will be highly dependent on spring precipitation. If the spring is dry, soil evaporation and plant growth will quickly deplete what soil water is present. Once spring rain stops, continued growth will be dependent on soil water content below 12 inches. In years when snowfall is limited on the desert, soil water below 12 inches is limited (below line 2) or unavailable (below line 3). Late spring and summer rain recharges primarily the upper 12 inches.

Forage Production

The forage production of perennial grasses has varied as much as 270 percent between drought years and wet years. Variation in production of annual grasses is even more extreme. Decreased forage production because of drought is directly related to a shortened growing season, with a decrease of up to 4 weeks during severe drought. In drought years, minimal regrowth will occur following grazing during the boot stage. Regrowth following grazing prior to the boot stage will usually produce adequate forage for reentry at a later date except for the most severe drought years. A dry spring could produce as little as 60 percent of a normal forage crop on eastern Oregon perennial grass range. However, in extreme cases even less could be expected.

Plant Vigor

Condition of the plants going into the drought is probably the greatest factor influencing the effect of drought on forage plant health. Past grazing management will probably have a greater impact on health of the forage crop than management during the drought. Vigorous plants should survive the drought well. In normal years, the greatest impact of grazing on plant growth is during the boot stage, with early spring use (during the vegetative stage) having little impact on plant health and growth. In a drought year, early spring use will probably have a greater impact on plant growth due to the shortened growing season.

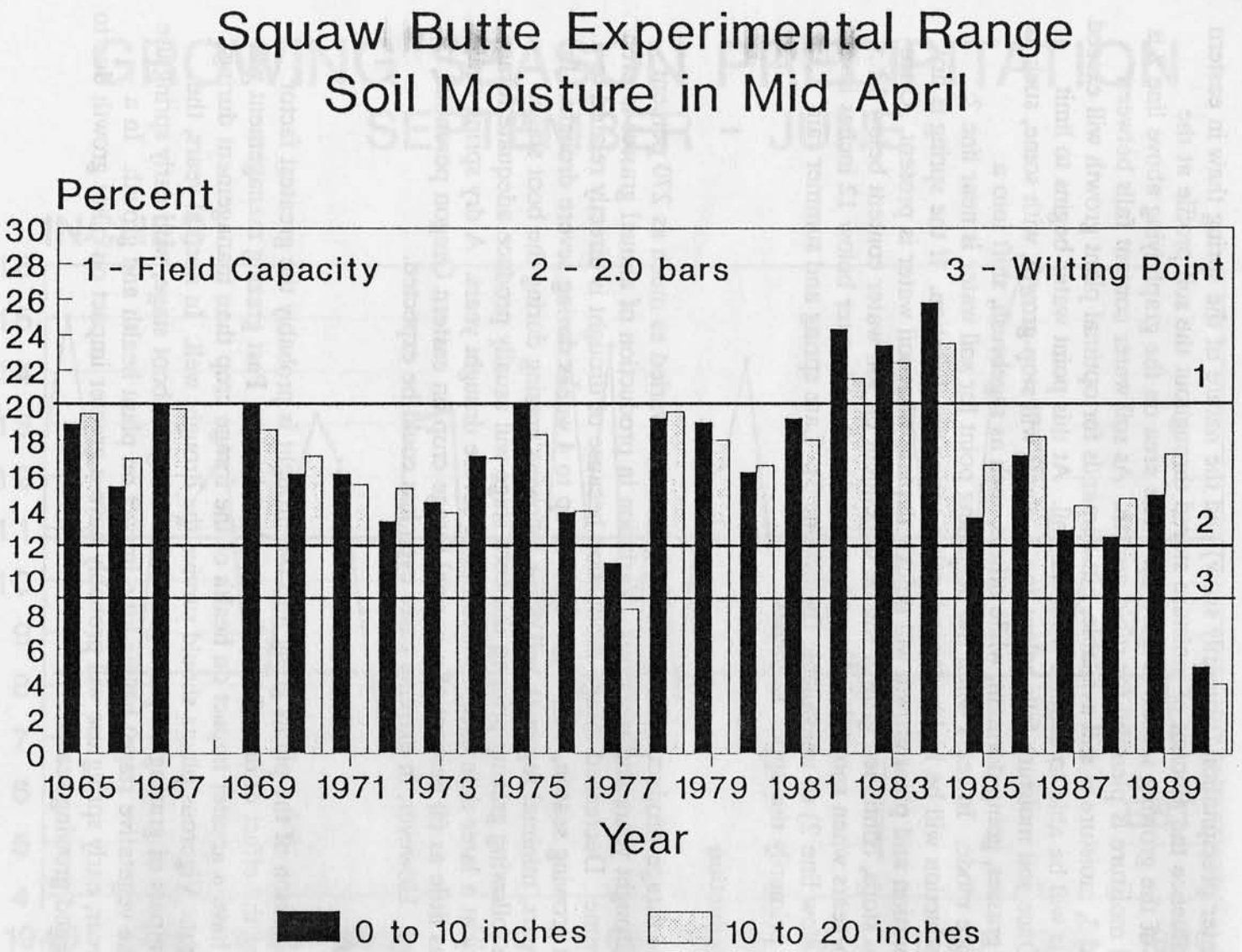


Figure 2. Soil moisture at two soil depths recorded in mid-April on the Squaw Butte Experimental Range, Eastern Oregon Agricultural Research Center. Line 1 = field capacity, line 2 = 2.0 bars, line 3 = wilting point (-15 bars). Available soil water for plant use (lines 1, 2 and 3) varied with soil texture.

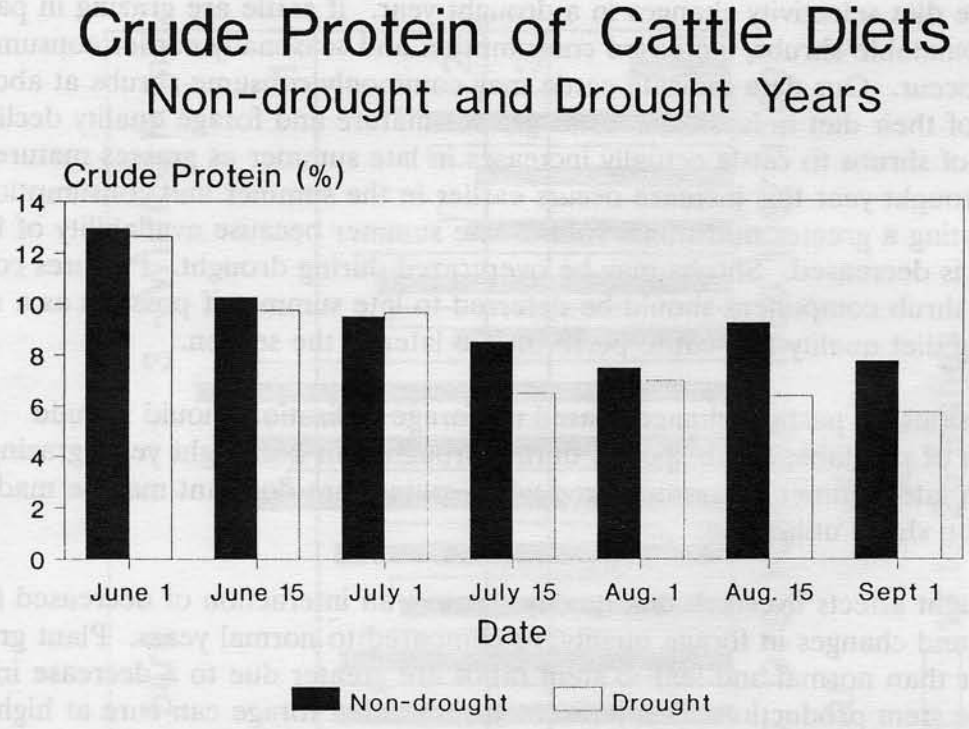
Cattle Diets

Cattle diet selectivity changes in a drought year. If cattle are grazing in pastures containing palatable shrubs, increased consumption and seasonally earlier consumption of shrubs can occur. Our data indicate cattle may commonly consume shrubs at about 25 percent of their diet in late summer as grasses mature and forage quality declines. Palatability of shrubs to cattle actually increases in late summer as grasses mature and dry. In a drought year this increase occurs earlier in the summer and consumption may double, creating a greater nutritional void in late summer because availability of forage and browse is decreased. Shrubs may be overgrazed during drought. Pastures containing a palatable shrub component should be deferred to late summer if possible as a means of improving diet quality and cattle performance later in the season.

Decisions on pasture changes based on forage utilization should include examination of palatable shrub species during drought. In a drought year, grazing use decisions on late-summer pastures grazed when grasses are dormant may be made based exclusively on shrub utilization.

Drought affects livestock diet quality through an interaction of decreased forage production and changes in forage quality, as compared to normal years. Plant growth stops earlier than normal and leaf to stem ratios are greater due to a decrease in reproductive stem production. Some research shows that forage can cure at higher quality during drought, perhaps due to cessation of growth prior to reaching full development. Data from the Hall Ranch (Figure 3), collected during the 1977 drought, show that crude protein in the diet is at normal year levels until mid July, after which it is generally lower than normal. Forage digestibility during the same time period was considerably lower than in either 1975 or 1976. In summary, diet quality in spring and early summer will be similar to normal, however, if livestock remain in the same pasture season-long, diet quality will be marginal to deficient by late summer, and will be lower than in normal years. Lower diet quality in late summer is caused by the before-mentioned decreased forage availability, which results in a more rapid depletion of high quality forage because of selective grazing by cattle.

Since initial forage quality is not greatly different, the primary concern, then, is to maintain adequate availability in late summer by moving through seasonally grazed pastures in less time; providing alternative grazing on pastures which have been deferred until late summer; purchasing additional pasture; or providing supplement. The preferred option will depend on costs and availability.



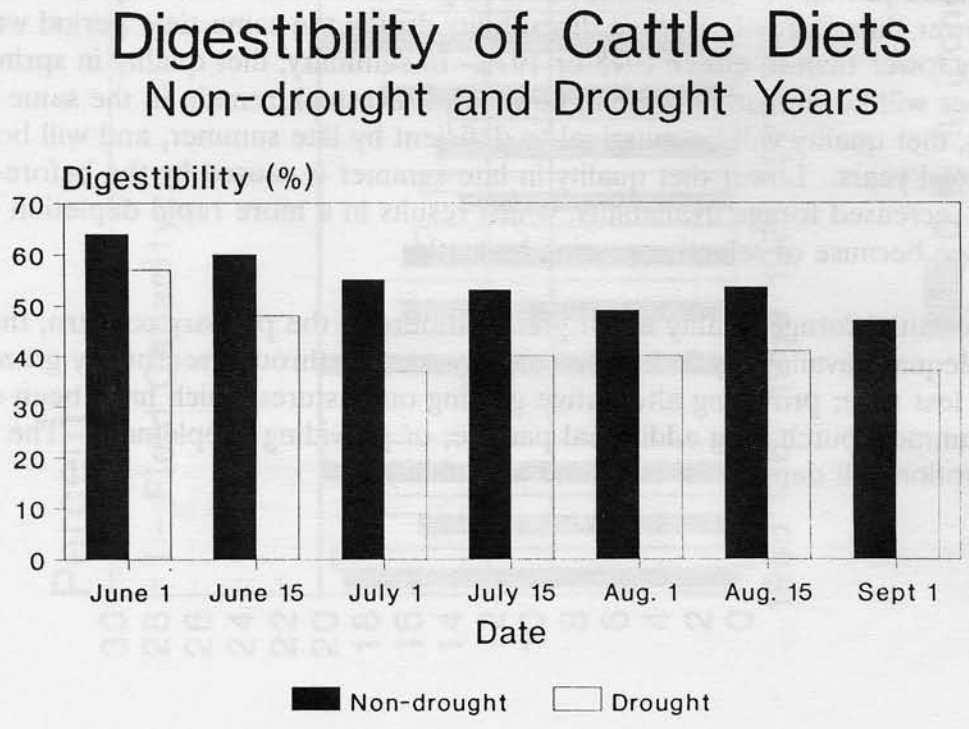


Figure 3. Crude protein and digestibility of cattle diets during drought and non-drought years.

Cattle Management

There are many management practices that will reduce overall winter feed needs or stretch existing hay supplies. On operations where calves are kept and sold as yearlings, these animals can be marketed at weaning. Early weaning is also an option that saves feed normally consumed by the calf and assures that the cows will enter the winter in better condition. This reduces the amount of feed or quality of feed required to winter these cows. Pregnancy testing to cull open cows and strict culling of marginal cows will also reduce winter feed needs.

Buying feed is also an alternative to reducing numbers. Purchasing meadow hay, alfalfa, straw, crop by-products or cereal grains may be necessary to keep the base herd intact. Replacement values for these various feedstuffs can be found in various publications, including some from the Eastern Oregon Agricultural Research Center, as well as the nutritive requirements of the various classes of animals.

Feeding ionophores is also a way to stretch hay supplies. Monensin at the rate of 50 to 300 mg per head per day will provide the same cow performance on 10-15% less hay as those fed a full feed of hay. The optimum rate is probably about 100-200 mg. The carrier used to feed the ionophore will further reduce the amount of hay needed.

Strip grazing rake-bunched hay with New Zealand type electric fences would also be a viable alternative to harvesting hay and feeding it back out. This will cut winter feeding costs by $30 per head. This projected saving could be used to purchase additional feed. This would be a particularly appealing alternative where the expected hay production is going to be less than the amount needed so that the entire property could be managed in this manner. In other years where production exceeds needs, the excess would be harvested and stored.

Water Hauling

Experiment Station personnel monitored water-hauling costs from June 1 through June 30, 1987. Water was pumped from a depth of 600 feet into a 2,000-gallon tank on a 2-1/2-ton truck. This water was hauled and dumped into 750-gallon circular flat-bottom metal troughs. An average of 349 animal units were supplied with ad libitum water in this manner. Management dictated the need for five different pastures and the water location within the pasture changed with forage availability. Enough troughs were used to assure a 3- to 4-day water reserve for emergency use. The average round-trip distance between well and trough was 7.4 miles. The roads traveled were probably one class above the desert trail-Jeep road typical of the High Desert. The water truck ran daily and covered 818 miles during the month with 124 man hours required.

Factors used to arrive at costs were:

Labor @ $4.50/hr	$558.00
Fuel @ $0.85/gal	183.00
1/6 of a new tire @$27	27.00
Oil @ $1/qt	16.00
Pumping costs - 1,640 Kwh	93.00
Truck cost ÷ 5 years ÷ 6 months	87.00
Water trough cost ÷ 10 years ÷ 6 months	110.00
Total Cost (June 1987)	$1,074.00

Various analyses lead to the following water hauling cost:

$3.08/AUM

10.25¢/AU Day

$1.31/mile

The above costs will vary with each operator depending on variables that include: distance from water sources, size and cost of truck, labor rate, number of trough locations, and condition of roads and troughs.

One of the most surprising points to come out of this analysis was the inefficiency brought about by evaporation, spillage and leakage. Assuming a daily water intake of 10 gallons per animal unit, it is estimated that less than 55% of the water pumped was actually consumed by the livestock. Items that can help cut water-hauling costs include: A careful and knowledgeable driver, regular vehicle service and maintenance, immediate repair of all leaky troughs and tanks.

Eastern Oregon Agricultural Research Center publications available with pertinent information on management during drought:

Vavra, M. and F.A. Sneva. 1978. Seasonal diets of five ungulates grazing the cold desert biome. Proceedings of the First International Rangeland Congress 435-437.

Holechek, J. L. and M. Vavra. 1983. Drought effects on diet and weight gains of yearling heifers in northeastern Oregon. J. of Range Management 36(2):227-231.

Sneva, F.A., L.R. Rittenhouse, and V.E. Hunter. 1977. Stockwater's effect on cattle performance on the High Desert. Ag. Exp. Sta., Oregon State Univ. Sta. Bul. 625.

Turner, H.A. 1987. Utilizing rake-bunched hay for wintering mature cows. In: 1987 Progress Report . . . Research in Beef Cattle Nutrition and Management. Ag. Exp. Sta., Oregon State University Special Report 801.

Raleigh, R.J. and J.D. Wallace. 1961. Performance of calves as influenced by time of weaning. In: 1961 Progress Report . . . Research in Beef Cattle Nutrition and Management. Ag. Exp. Sta., Oregon State Univ. Miscellaneous Paper 106.

Miller, R.F., M.R. Haferkamp, and R.F. Angell. 1990. Clipping date effects soil water and regrowth in crested wheatgrass. J. Range Manage. 43(3):251-255.

Raleigh, R. J. and J. D. Wallace. 1963. Wintering mature cows on limited rations. In: 1963 Progress Report . . . Research in Beef Cattle Nutrition and Management. Ag. Exp. Sta., Oregon State Univ. Special Report 145.

Raleigh, R.J. and J.D. Wallace. 1964. Supplemental energy and protein requirements for weaned calves fed early and late cut meadow hay. In: 1964 Progress Report . . . Research in Beef Cattle Nutrition and Management. Ag. Exp. Sta., Oregon State Univ. Special Report 171.

Raleigh, R.J. and J.D. Wallace. 1964. Supplementing yearlings on native range. In: 1964 Progress Report . . . Research in Beef Cattle Nutrition and Management. Ag. Exp. Sta., Oregon State Univ. Special Report 171.

Raleigh, R.J. and J.D. Wallace. 1965. Nutritive value of range forage and its effect on animal performance. In: 1965 Progress Report . . . Research in Beef Cattle Nutrition and Management. Ag. Exp. Sta., Oregon State Univ. Special Report 189.

Raleigh, R.J. and J.D. Wallace. 1965. Yearling cattle gains on native range forage and bunched hay. In: 1965 Progress Report . . . Research in Beef Cattle Nutrition and Management. Ag. Exp. Sta., Oregon State Univ. Special Report 189.

Raleigh, R.J., H.A. Turner, and R.L. Phillips. 1970. Commercial cow herd selection and culling practices. In: 1970 Progress Report . . . Research in Beef Cattle Nutrition and Management. Ag. Exp. Stat., Oregon State Univ. Special Report 288.

Raleigh, R.J., H.A. Turner, and L. Foster. 1971. Management of cattle grazing native flood-meadows. In: 1971 Progress Report . . . Research in Beef Cattle Nutrition and Management. Ag. Exp. Sta., Oregon State Univ. Special Report 322.

Foster, L. and R.J. Raleigh. 1974. Liquid supplements in beef cattle production. In: 1974 Progress Report . . . Research in Beef Cattle Nutrition and Management. Ag. Exp. Sta., Oregon State Univ. Special Report 407.

Phillips, R.L. and M. Vavra. 1975. Feeding grass straw to wintering beef cows. In: 1975 Progress Report . . . Research in Beef Cattle Nutrition and Management. Ag. Exp. Sta., Oregon State Univ. Special Report 431.

Turner, H.A. and R.J. Raleigh. 1976. Improved efficiency for wintering cows being fed rumensin. In: 1976 Progress Report . . . Research in Beef Cattle Nutrition and Management. Ag. Exp. Station, Oregon State Univ. Special Report 455.

Vavra, M., R.L. Phillips, and M.M. Wing. 1976. Weaning management of spring calves on forest range. In: 1976 Progress Report . . . Research in Beef Cattle Nutrition and Management. Ag. Exp. Sta., Oregon State Univ. Special Report 455.

Phillips, R.L., M. Vavra, and R.J. Raleigh. 1977. The effects of nutrition level on the performance of wintering cows. In: 1977 Progress Report . . . Research in Beef Cattle Nutrition and Management. Ag. Exp. Sta., Oregon State Univ. Spec. Rpt. 480.

Turner, H.A., R.F. Angell, and M.R. Haferkamp. 1984. Strip grazing rake-bunched hay and standing forage as alternatives to wintering cows on baled hay. In: 1984 Progress Report . . . Research in Beef Cattle Nutrition and Management. Ag. Exp. Sta., Oregon State Univ. Special Report 714.

Vavra, M. and R.L. Phillips. 1980. Drought effects on cattle performance. Proceedings, Western Section, Amer. Soc. of Animal Science, Vol. 31:157-160.

Attention is also directed to The Grazier, April 1988 for a list of Oregon State University publications on drought and a discussion of rangeland management during drought.