



# Range Nutrition in Relation to Management

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Matching the nutrient demands of livestock and the nutrients supplied by range forage comprises a real balancing act for a considerable portion of each year. Operators should know the basic needs of their stock at any one time during the production cycle. However, the changes in nutritional status of the animal's diet from day to day as the season progresses is not so well known. Because range forage nutritional values vary so greatly from one location to another, only examples of nutrient amounts and trends will be used. Whenever possible, general principles of production in relation to nutrient availability will be stressed.

## Nutritional value

Levels of plant nutrients are reported as chemical composition and apparent digestibility percentages, that is, concentrations in the plant material. Numerous ways of expressing nutritional values have been developed. Most of the time, research must use indirect methods of one kind or another when dealing with range and pasture forages. Consequently, a good deal of estimation of value is done.

For a plant to have value it must be selected and grazed by the animals and it must contribute substantially to the digestible nutrients of the diet. Therefore, selectivity by grazing animals is important in determining value of the plant species on a particular range. It is possible to minimize the effects of selective grazing by forcing or stimu-

lating uniform use at particular seasons. Animals may not perform quite as well when use is forced.

The rumen bacteria are responsible for digestion and they may not be as "fussy" as the animal's taste buds. Therefore, performance could be better than expected if you can get the animals to graze the plants available. Unpalatable plants do not necessarily have poor nutritive value but their forage value is because they generally are not selected. Some plants, such as milk vetches and lupines, have both high nutritive value and are palatable, yet are harmful to cattle.

The species composition on the range has a great bearing on the forage value obtained from it. Figures 1, 2, and 3 show seasonal crude protein and moisture contents and apparent drymatter digestibility of several important forage species from south-central Oregon shrub-grass ranges. Note that the crude protein levels of the grasses are often in excess of 20 percent at the start of growth in spring but decline at different rates to 5 percent or less by the end of the season. Although not shown, seasonal trends with forbs (herbaceous plants other than grasses) are similar, although protein levels of legumes are higher than grasses in mid to late season. However, the leaves of forbs, where nutrients are often concentrated, shatter when the plant dries. This then renders nutrients unavailable.

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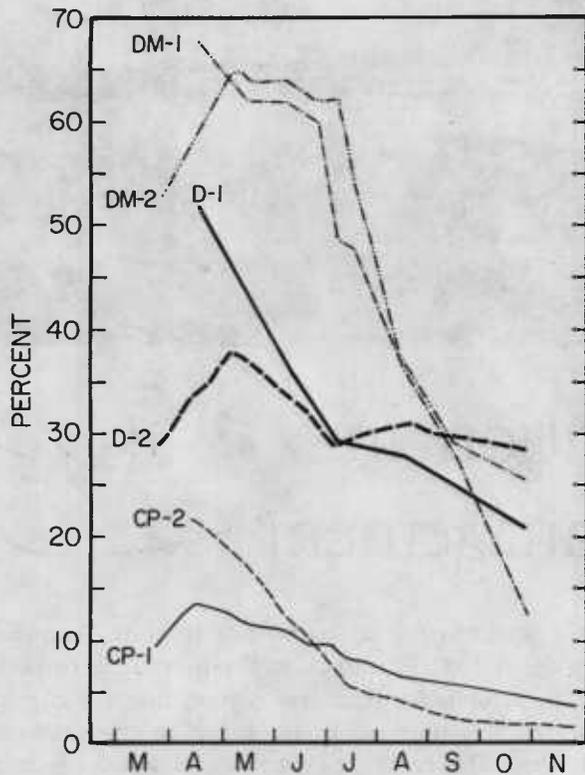


Figure 1. Seasonal trends in crude protein (CP), apparent digestibility (D), and dry matter (DM) of bluebunch wheatgrass (1) and Idaho fescue (2) in south-central Oregon.

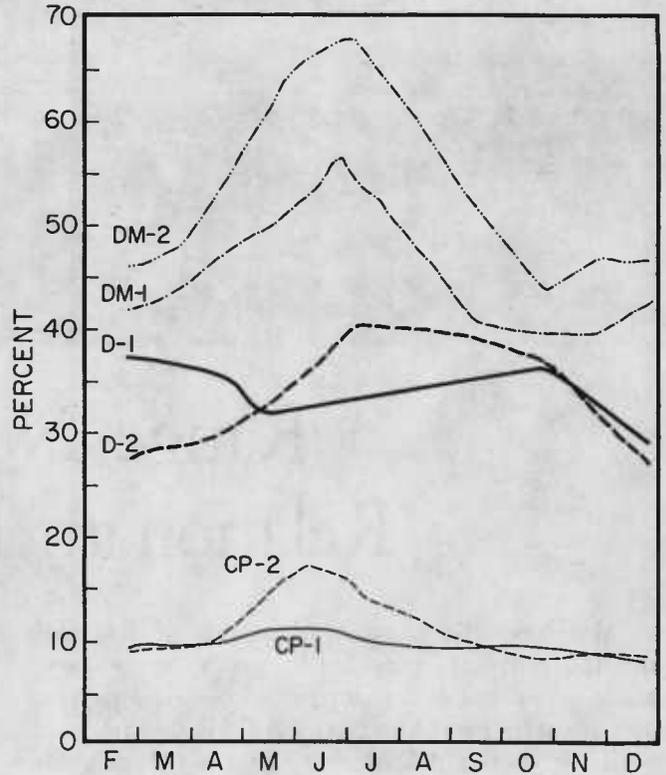


Figure 3. Seasonal trends in crude protein (CP), apparent digestibility (D), and dry matter (DM) of western mountain mahogany (1) and bitterbrush (2).

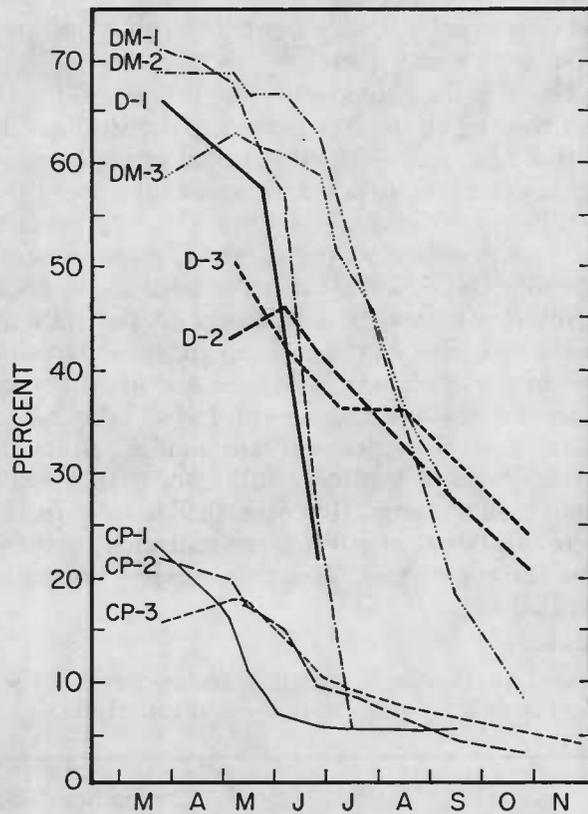


Figure 2. Seasonal trends in crude protein (CP), apparent digestibility (D), and dry matter (DM) of Sandberg bluegrass (1), squirreltail (2), and Thurber needlegrass (3).

Note that seasonal trends in nutritional values for the shrubs differ greatly from grasses. Producers whose cattle utilize browse ranges will recognize from experience why performance can be reasonably high into late season. Note that crude protein in shrubs stabilizes at levels around 10 percent in the fall and winter, whereas that of grasses is less than 5 percent. However, if the shrubs are not palatable and will not be grazed at all, cattle will need to subsist entirely on mature grasses and forbs, which will be low in digestible protein and energy. Research shows that nutritive value differences between species within a single year are as great as the differences between years. Consequently, it is nearly impossible to predict accurately the nutritive values at particular times in the growing season without knowing what kind of growing season will exist. Figure 4, illustrating a composite of several Oregon high-desert grasses over several years, shows insufficient protein content after early July to sustain high levels of performance.

#### Digestive physiology

The ruminant can survive, grow, and reproduce on forage alone because of the bacteria and protozoa contained in the rumen section of the stomach. These microbes have the ability to use the chemicals found in forages for their own

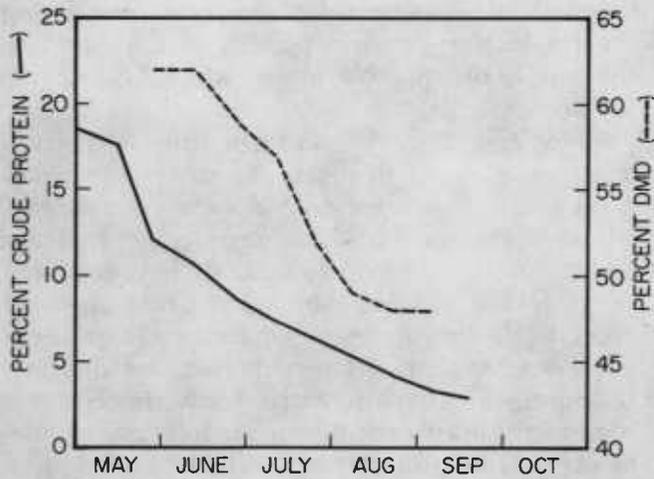


Figure 4. Seasonal declines in percent crude protein and dry matter digestibility of perennial bunchgrasses in the Oregon high desert.

growth and reproduction. Microbes, in essence, digest the food the animal eats. As this occurs, certain synthesis actions take place, including synthesis of all of the B vitamins and of the amino acids from nitrogenous compounds (protein) in the food. In a sense, the microbes can make a complete diet out of what would otherwise appear to be only a partial diet. Then, as microbes die, their body products are absorbed by the animals for their basic nutrient needs. In reality, we provide a diet which satisfies the rumen microbes and if they are satisfied, the animal is satisfied.

Levels of most nutritive components decline as a plant matures, regardless of species. Protein in the diet can become limiting before energy does for young cattle and lactating cows. This is one of the main reasons why performance of these classes of cattle declines sharply when the forage matures. Cattle tend to select diets that are higher in protein and lower in fiber than that contained in the total available forage when it is growing. After plant maturity, selectivity may increase, but several research studies show dietary values and values of the mature plant to be more similar than different.

The animal must be able to consume enough forage to meet its needs. Amount of forage intake is especially important early in the plant's growth period. Studies show that the amount of moisture can limit the amount of total dry matter intake but the moisture content in itself should not affect the level of gain. Research at the Squaw Butte Experiment Range in eastern Oregon shows that gains of yearlings on forage alone were as high from early May to early July as they were when either protein or energy supplements were given. Both before and after these stages some deficiencies usually exist, although supplementation pro-

grams are designed to compensate for this. Protein quality (the composition of amino acids) is not important for the ruminant, but the total amount of crude protein or nitrogen-containing material is important. Ruminants synthesize their protein needs from the nitrogen. In fact, non-protein nitrogen sources, such as urea, are commonly used in protein supplements. The supply of digestible carbohydrates must be above a certain minimum level for this to occur successfully, or the animal could suffer from acidosis or from too much ammonia released within the system.

After the time of optimum combinations of nutrients occur in the forage, the manager has the option of moving stock to areas of less mature plants, of supplementing that forage, or of modifying the demand, as in weaning the calves or taking off yearlings. Often, forage value differences may occur within a fairly short geographical distance. For example, species mature later on cool slopes and at higher elevations. Grazing these at later dates is commonly done to extend the season of acceptable forage value.

Comparison of the curves in Figures 5 and 6 shows that protein becomes deficient before en-

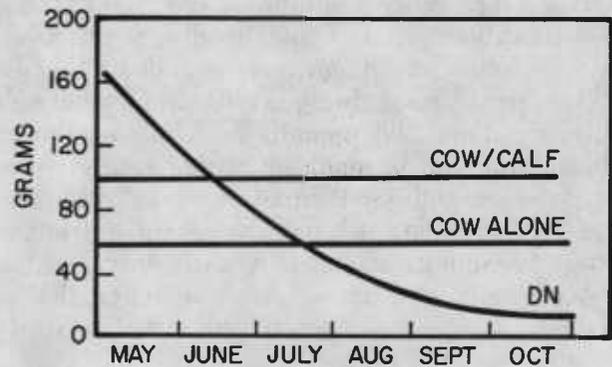


Figure 5. Amount of digestible nitrogen required by cows with calves and dry cows and the amount they will get from the range forage.

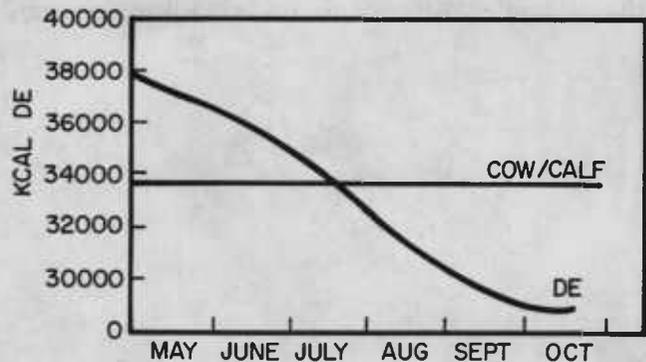


Figure 6. Amount of digestible energy required by cows with calves and the amount they will get from the range forage.

ergy does on sagebrush-bunchgrass ranges. Based on those nutritional relationships and the fact that calves gained less than 1 pound daily after September 1, research at Oregon's Squaw Butte Agricultural Experiment Station suggests weaning spring-born calves in September. Keeping calves on their dams, compared to weaning and putting on grass hay without limit, but with a daily ration of 2 pounds barley and 1 pound cottonseed meal, resulted in less than one-half the daily gain. Post-weaning shock was greater for the normally weaned calves (late October) and this resulted in a daily gain of only .6 pound for the next 35 days, as compared to 1.5 pounds for those early weaned.

Early weaning does not work the same under all range forage conditions. Where forage quality in the fall is sufficient for cows to continue milking, calf gains should be as high as when weaned and fed. Such forage conditions might be those on ranges with palatable browse, where use was deferred until fall, where regrowth of seeded species such as crested wheatgrass, Russian wildrye, or intermediate wheatgrass are available, or where irrigated pastures or meadow aftermath exists.

Time of calving can be keyed to range forage conditions better at some seasons than others. Most calves are spring-dropped. Under poor summer and fall range conditions, but good spring feed conditions where winter feeding is practiced anyway, some advantages exist to fall calving, as regards use of range forage. With an October calf weighing about 300 pounds in April, maximum efficient use can be made of spring forage, since forage values will be adequate for good milk production and calves are old enough to utilize the forage. Weaning can occur in early July and the dry, pregnant cow turned back to range that is adequate for her needs until she is nearly ready to calve.

Conversely, studies also show that when forage values remain high from May to October, spring or winter calving will allow efficient forage use without having to feed too heavily or too long during winter. Advantages and disadvantages can

be cited for different times of calving, but fitting the production demand pattern of the cattle to the supply of available forage will be the key to the problem.

Supplementing range forage still is not common practice, but there are times when it makes good sense. Supplementing does not mean substituting purchased feed for range forage. It means making up the difference in quality between what range forage provides and what cattle need. In order to do this successfully, the producer needs to know what nutrients are deficient, how deficient they are, and what alternative feeds are economic to accomplish successful supplementation. Supplements may be primarily of a protein nature, of an energy nature, or of a mineral nature. So much variation exists in the use for supplements that it is impossible to mention all of the needs for them.

Dry forage often is supplemented with some form of protein. Adding nitrogen or protein to the diet stimulates the rumen microbes to digest fibrous material more effectively; this causes a more rapid rate of passage, the animal eats more range forage, and performs better. Liquid forms in a molasses base, with added phosphoric acid, often are used, so some energy is included.

On lush, spring pastures, small daily increments of grain have given effective results in Colorado and Oregon studies. On wet, high-protein grass, a high urinary protein loss can occur. Provision of supplemental energy helps to counteract this. After crude protein content of forage declines to below requirements, these studies showed that addition of small quantities of protein, in addition to energy, would promote effective forage use and keep up performance. No supplements would be needed during the May-July period, however. This kind of program would be suited to an operation that did not have good summer range. Yearling heifers could be grown out well and should breed well, yearling steers would gain well and first calf heifers would be able to make continued growth, milk, and breed back on time.