IMPROVED CATTLE PRODUCTION ON FORESTLANDS[1]

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Cattle grazing is presently considered a secondary activity on many forestlands. Little management has been applied, and often cattle are grazed in large units season long. However, it is predicted that forest ranges will be expected to increase livestock grazing during the next 20 years. Forestlands of eastern Oregon and Washington are usually considered "summer range." Within this area are identified 15 million acres of forested range, 1.5 million acres of grassland, 700,000 acres of mountain meadow, and 1 million acres of subalpine grassland. With no way to increase acres grazed, any increase in grazing must be accommodated by improved grazing efficiency and forage production.

The wide array of soil types, slope exposures, elevation changes, precipitation amounts and hence the wide diversity of plant communities present whose phenology is quite different at any given date provide the potential for improved efficiency in livestock production. Silvicultural practices provide still other plant communities. Changes in forage nutritional quality are related to advancing plant phenology. However, little attention has been paid to coordinating specific grazing management practices with changes in forage quality. If this were done, efficiency of production in terms of pounds of red meat produced per acre could be improved.

PLANT COMMUNITY INTEGRATION

Plant communities on forestland may exist in the same precipitation zone and the same elevation and in fact occur as opposing slopes in the same drainage but have vastly different plant communities present because of the soil type and depth, and slope exposure. Riparian zones present still another potential community difference.

Grassland and Forest

Three years data were collected on cattle diet quality and botanical composition, and daily intake on grassland and forest communities at the Starkey Experimental Forest in the Blue Mountains. Sampling was divided into four periods through the grazing season (late spring June 15 - July 15; early summer July 15 - August 15; late summer August 15 - September 15 and fall September 20 - October 15).

Different forage classes are known to differ in nutritional quality and, therefore, diets of varying percentages of forage classes can be expected to be diverse in nutritional quality. The National Research Council (NRC) (1976) states that a 650-pound heifer requires 1.30 pound of crude protein and

[1] Partial funding was provided by the Pacific Northwest Forest and Range Experiment Station as part of PNWFRES project 1701.

18.06 megacalories of digestible energy daily for an average daily gain of .65 pound. Comparing requirements to actual consumption can give an indication of expected beef production (Table 1). Twice during the study, cattle on forest consumed less than the required amount of crude protein. Four periods of protein deficiency occurred on the grassland. Digestible energy was deficient during six sampling periods on the forest and during eight periods on the grassland. Generally, late spring diets were not a problem on either pasture. However, during early and late summer, cattle on the forest consumed diets that were superior to those consumed on the grassland. During fall, grassland diets were of better energy quality than those on the forest while the reverse was true for crude protein. Cattle then, could be expected to gain similarly during late spring on either pasture, gain better on the forest in early and late summer, and vary from year to year during fall. Actual cattle response (Table 2) was similar to that expected. Data in Tables 1 and 2 indicate that a management scheme incorporating both grassland and forest pastures into a grazing system that takes full advantage of forage at its highest quality could improve beef production. Cattle grazing the grassland in late spring, the forest in early and late summer and then the grassland again in fall should gain better than cattle grazed exclusively on one type or perhaps even allowed free choice of both types. A study involving cattle so managed was initiated in 1982. Average daily gains were better on the managed system only during the late summer period of 1982 (Table 2). Ample precipitation and hence, near optimum forage conditions in 1982 negated larger differences. However, managed cattle did gain 18 pounds more per head than cattle grazing grassland and forest free choice. That amounted to 472 pounds more beef produced by the managed system.

Table 1. Average daily intake of crude protein (lb) and digestible energy (megacalories) on the forest and grassland in 1976, 1977, and 1978

Sampling period	1976		1977		1978	
	Forest	Grass-land	Forest	Grass-land	Forest	Grass-land
			Crude protein intake			
Late spring	.99	1.46	1.85	1.68	1.87	1.76
Early summer	1.50	1.32	1.39	1.12	1.59	1.39
Late summer	1.92	1.72	1.46	1.04	1.10	.84
Fall	1.59	1.46	1.48	1.54	1.85	1.39
			Digestible energy intake			
Late spring	11.4	13.7	20.6	19.9	18.8	21.3
Early summer	19.9	17.1	16.1	14.4	18.7	17.3
Late summer	18.2	17.6	17.2	12.6	12.4	12.1
Fall	14.7	19.9	16.0	19.3	19.9	14.3

Table 2. Average daily gain (lb) for yearling heifers on the forest and grassland

Sampling period	1976		1977		1978	
	Forest	Grass-land	Forest	Grass-land	Forest	Grass-land
June 20 - July 20	-.13	.49	1.39	1.10	1.48	1.76
July 20 - Aug. 20	1.35	.95	0.0	.73	2.43	.90
Aug. 20 - Sept. 20	1.12	.90	1.59	.18	-.82	-.88
Sept. 20 - Oct. 15	.93	1.26	-.02	.60	1.01	.62

	1979		1980		1982	
	Forest	Grass-land	Forest	Grass-land	Managed	Free Choice
June 20 - July 20	.57	1.12	3.09	3.62	3.33	3.17
July 20 - Aug. 20	4.06	1.98	.09	.62	1.70	1.72
Aug. 20 - Sept. 20	1.48	1.87	1.70	.82	1.70	1.00
Sept. 20 - Oct. 15	.60	-.55	.49	1.01	.84	.87
					1.85	1.69

Continued late spring use of the grassland pasture may cause a decline in range condition. A system designed to prevent this would incorporate two each of forest and grassland pastures so that one grassland pasture would be grazed in the growing season every other year. Forest pastures could also be rotated.

Meadow Grazing

Another alternative exists where riparian meadows are large enough to accommodate inclusion as distinct grazing units. A riparian zone located between the forest and grassland pastures previously discussed was grazed by cattle on a deferred rotation basis for 5 years beginning about August 20 each year. Average daily gains were variable depending on year studied. Riparian meadow pastures that are large enough to be practically grazed can be incorporated for late summer and fall use into a system of grassland and forest pastures.

A Working Example

The grazing system used on the Eastern Oregon Agricultural Research Center's Hall Ranch provides an example of how a cow-calf system can be integrated over several plant communities to provide improved beef production. The system made use of sub-irrigated meadows, pine-upland pastures dominated by pinegrass (*Calamagrostis rubescens*), elk sedge (*Carex geyeri*), and Kentucky bluegrass (*Poa pratensis*); and mixed-fir slopes dominated by the same understory species (Figure 1) Meadows can be grazed first, but for a short time period so that regrowth occurs and can provide fall forage. Open ponderosa pine stands dominate the pastures

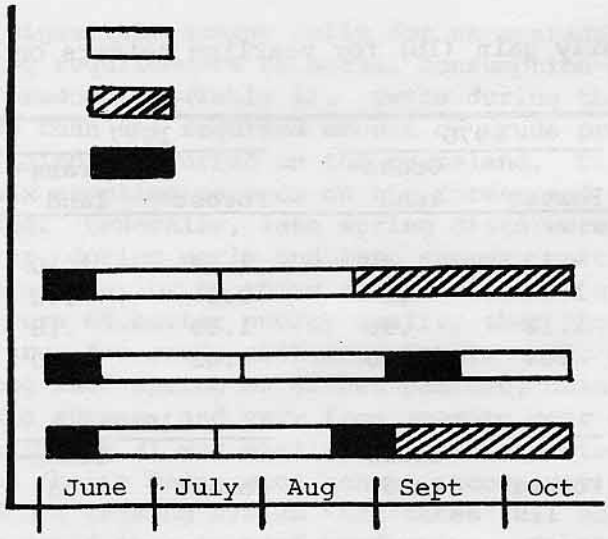

Figure 1. The summer grazing schedule by pasture type.

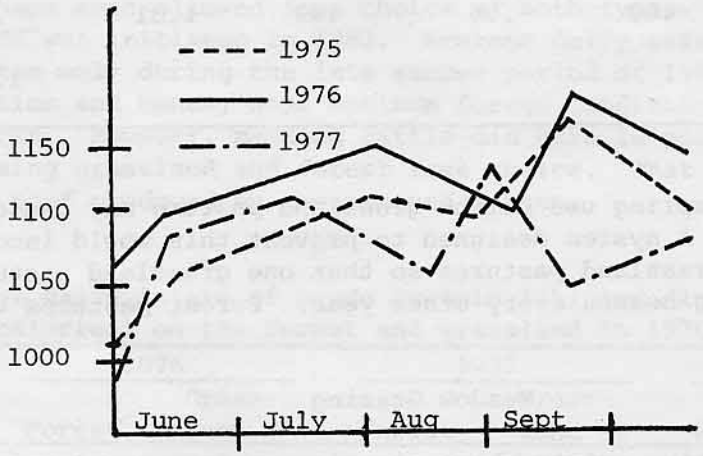

Figure 2. Cow weights (lb) for the summer grazing seasons.

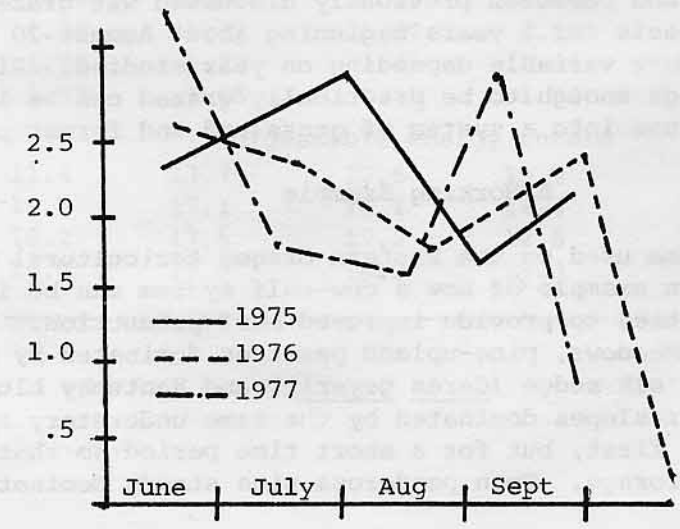

Figure 3. Average daily gain (lb/day) of calves for the summer grazing seasons.

grazed during the June 15 to August 20 period. Forage quality on these pastures deteriorates below required levels by late August. Autumn pine needle fall also reduces use under the canopy so early grazing is usually more efficient. Late summer and fall use on the Hall Ranch is one of options. Cattle may be grazed on meadow pastures that are sub-irrigated and still provide nutritious forage on grazed or mixed conifer stands. The less advanced phenological stage of north slope understory vegetation is also a more nutritious forage than vegetation on the pine uplands.

Cows initially gained weight on range, then as forage quality declined cows actually lost weight until moved to a higher quality pasture (Figure 2). Calves gained weight throughout the grazing season but the actual amount per day varied with forage quality (Figure 3). Forage on all pastures on the Hall Ranch is usually of marginal nutrient quality by September 15 of most years. Therefore, calves are usually weaned at that time to prevent possible weight loss. Skovlin (1962) weighed cows and calves grazing the Blue Mountains of Oregon and did record a weight loss on suckling calves during the fall grazing period of some years. Calves on the Hall Ranch were not weaned on September 15, 1975, and a rapid decline in average daily gain was noted late in the fall. During the drought year of 1977, this rapid decline in average daily gain was noted earlier in the grazing season.

PRODUCTION IMPROVEMENT

In a study conducted in Grant County, Oregon, specific forage production improvement practices were compared to unimproved "native" plant communities for potential beef production. Grassland, lodgepole pine, mixed conifer, and moist meadow communities were compared. Previously applied treatments sampled were Idaho fescue-bluebunch wheatgrass (Festuca idahoensis-Agropyron spicatum) grassland which was plowed and reseeded to alfalfa (Medicago sativa) and intermediate wheatgrass (Agropyron intermedium); lodgepole pine stand that was precommercially thinned; a mixed conifer stand that was commercially logged, the slash piled and burned and the area reseeded to orchardgrass (Dactylis glomerata) and timothy (Phleum pratense); and a moist meadow that was plowed and reseeded to beardless bluebunch wheatgrass, timothy, and smooth brome (Bromus inermis). The unlogged mixed-conifer stand contained 173 trees and 38 saplings per acre and the logged stand contained 112 trees and 3.6 saplings per acre. Thinned and unthinned lodgepole pine stands contained 198 and 1,160 trees per acre, respectively. Estimated pound/acre of forage was recorded monthly from April through September and each major forage species present was sampled and analyzed for crude protein content and in vitro dry matter digestibility. Beef production was estimated as heifer-unit-days (HUD) per acre and pounds of gain produced per acre. Estimated metabolizable energy (ME) and crude protein (CP) per acre were calculated from the total pounds of usable forage produced per acre and the ME and CP content of the forage. Each of these figures was divided by the ME and CP requirements of a yearling heifer (NRC 1976) to estimate HUD and pounds of beef produced per acre. Data produced are best used for comparison purposes as cattle could increase their intake to make up for declining ME and CP in forage. The tables do not consider this and therefore "no gain" and "loss" occur sooner in the year in the tables than in actuality (Tables 2 and 3).

Table 3. Average daily gain (lb) of cattle grazing a riparian zone meadow in late summer and fall

	1976	1977	1978	1979	1980
Aug. 20 - Sept. 20	2.18	1.01	-.09	.26	1.35
Sept. 20 - Oct. 15	.29	.35	1.63	.35	1.63

Data in Tables 4, 5, 6, and 7 demonstrate the improvement in livestock production possible with various cultural practices and also aid the development of grazing systems whereby each plant community type can be grazed when maximum beef production can be obtained. Loss or no gain stated in the table occurs when the crude protein or energy requirement (NRC 1976) for animal maintenance was not met or just met. Gains are listed when requirements for specific amounts of gain were met. Data presented are conservative estimates as the tables are strictly based on requirements for crude protein and energy based on a predetermined dry matter intake. Grazing animals are capable to an extent of increasing intake above values listed by the NRC (1976). No gain or loss then, appear sooner on these estimates than if cattle were actually weighed.

Foothill grasslands are used as spring range and these data verify that is the best time. Lodgepole and mixed conifer stands begin to decline in digestible energy more rapidly than crude protein. Actual cattle diets from other studies (Table 1) reflect this as well. Digestible energy can be considered the first limiting nutrient on forestlands. Drought conditions intensify this deficiency. Lodgepole pine stands should be grazed as early in summer as possible as quality declines and the principal understory vegetation present (pinegrass Calamagrostis rubescens) becomes unpalatable as the summer progresses.

The unimproved mixed conifer stand maintained crude protein requirements better than did the improved because the shrub snowberry (Symphoricarpus alba) was present in the unimproved understory. Shrubs contain higher levels of crude protein later in the grazing season than herbaceous species. Grazing should occur on the improved conifer site before the unimproved.

Moist meadows similar to that studied should be grazed before August for beef production purposes. The unimproved meadow studied was composed primarily of the forbs wyethis and cinquefoil. Both forbs dried and shattered (designated in table by "no available forage") during the study period. Improved meadows had forage available later in the summer although yearling cattle could not be expected to perform well.

Table 4. Estimated heifer unit days (HUD) and beef production (pounds beef) per acre for 650 lb heifers on improved and unimproved grassland sites. Values were calculated on the basis of metabolizable energy (ME) or crude protein (CP) available in forage on the gives dates

	1980				1981			
	ME		CP (%)		ME		CP (%)	
Date	HUD	lb Beef	HUD	lb Beef	HUD	lb Beef	HUD	lb Beef
APRIL								
Unimproved	2.8	4.6	4.7	7.7	2.7	4.5	4.1	6.9
Improved	7.6	12.6	13.8	22.7	3.9	6.4	8.7	14.4
MAY								
Unimproved	14.0	15.4	14.2	15.7	5.7	9.4	6.6	10.9
Improved	58.0	95.9	92.5	153.0	13.7	22.7	21.4	35.5
JUNE								
Unimproved	32.7	Loss	25.3	13.9	24.0	Loss	9.1	10.0
Improved	66.9	111.0	94.1	155.5	42.4	70.0	66.5	110.0
JULY								
Unimproved	25.3	Loss	24.3	Loss	18.5	Loss	23.9	Loss
Improved	116.3	Loss	72.6	80.0	42.5	46.9	48.4	80.0

Table 5. Estimated heifer unit days (HUD) and beef production (pounds beef) per acre for 650 lb heifers on improved and unimproved lodgepole pine sites. Values calculated on the basis of metabolizable energy (ME) or crude protein (CP) available in forage on the given dates

	1980				1981			
	ME		CP (%)		ME		CP (%)	
Date	HUD	lb Beef	HUD	lb Beef	HUD	lb Beef	HUD	lb Beef
JUNE								
Unimproved	1.0	1.2	1.4	2.3	1.1	1.2	1.5	2.4
Improved	2.5	2.8	3.0	5.0	6.8	Loss	5.1	8.5
JULY								
Unimproved	1.9	Loss	2.3	3.8	3.3	Loss	2.2	3.7
Improved	3.2	Loss	3.6	6.1	8.2	Loss	5.3	8.7
AUGUST								
Unimproved	4.2	Loss	3.1	3.5	3.4	Loss	2.4	2.7
Improved	6.3	Loss	5.7	3.2	7.8	Loss	10.1	No gain
SEPTEMBER								
Unimproved	4.5	Loss	4.9	Loss	3.3	Loss	4.3	No gain
Improved	5.9	Loss	4.9	Loss	7.4	Loss	6.4	No gain

Table 6. Estimated heifer unit days (HUD) and beef production (pounds beef) per acre for 650 lb heifers on improved and unimproved mixed conifer sites. Values were calculated on the basis of metabolizable energy (ME) or crude protein (CP) available in forage on the given dates

	1980				1981			
	ME		CP (%)		ME		CP (%)	
Date	HUD	lb Beef	HUD	lb Beef	HUD	lb Beef	HUD	lb Beef
JUNE								
Unimproved	3.2	3.5	3.3	5.5	6.9	7.6	5.1	8.4
Improved	16.5	27.3	17.7	19.5	12.1	20.1	13.8	22.8
JULY								
Unimproved	8.6	Loss	5.0	8.3	8.5	Loss	5.3	8.8
Improved	88.9	Loss	93.8	No gain	41.8	Loss	33.9	18.7
AUGUST								
Unimproved	16.7	Loss	10.2	11.2	10.5	Loss	6.7	7.4
Improved	105.5	Loss	93.3	51.5	58.4	Loss	58.4	Loss
SEPTEMBER								
Unimproved	15.5	Loss	17.4	Loss	10.5	Loss	10.8	Loss
Improved	97.4	Loss	62.1	Loss	57.6	Loss	40.8	Loss

Table 7. Estimated heifer unit days (HUD) and beef production (pounds beef) per acre for 650 lb heifers on improved and unimproved moist meadow sites. Values were calculated on the basis of metabolizable energy (ME) or crude protein (CP) available in forage on the given dates

	1980				1981			
	ME		CP (%)		ME		CP (%)	
Date	HUD	lb Beef	HUD	lb Beef	HUD	lb Beef	HUD	lb Beef
JULY								
Unimproved	7.6	11.6	7.1	11.7	11.0	18.3	11.9	13.1
Improved	26.5	43.8	27.4	30.7	25.5	42.3	35.6	19.6
AUGUST								
Unimproved	12.6	Loss	20.0	Loss	No available forage			
Improved	62.4	Loss	37.6	Loss	54.5	Loss	40.9	Loss
SEPTEMBER								
Unimproved	No available forage				No available forage			
Improved	52.5	Loss	22.1	Loss	47.3	Loss	24.8	Loss

SUMMARY

The foregoing discussion has attempted to cite examples of how various forage resources can be incorporated into a grazing program that will improve the pounds of beef produced from a given unit of land without increasing the demand on the forage resource. Only livestock requirements for grazing have been discussed. A rancher or land manager must first consider the physiological needs of the forage resource and develop a grazing program that provides for such. After a stable forage resource is assured, modifications that enable improved cattle production are possible.

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