Cow and Calf Performance on Pasture-Forage Types during the Fall, mid October to mid November

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Introduction

Cow and calf weight performance is affected by changes in the quantity and quality of the herbage on grazinglands. As perennial plants in the Northern Plains mature during the growing season, they translocate leaf cell contents to other plant parts, and a decrease in herbage weight and nutrient quality results. By the late portion of the grazing season, most perennial plants are in the late stages of aging, or senescence. Weight performance of livestock grazing on the maturing vegetation decreases. The scope of this reduction in cow and calf weight gain during the late portion of the grazing season may not be obvious to beef producers when the spring, summer, and fall livestock weight gains are averaged across the entire grazing season. Evaluation of the fall cow and calf weight gains separately from animal performance during the other portions of the grazing season reveals the extent to which the late-season decline in herbage quality and quantity affects animal performance.

The purpose of this study is to document and compare cow and calf accumulated weight gain, rate of weight gain per acre, and rate of weight gain per day on pasture-forage types during the fall portion of the grazing season, mid October to mid November, on grazing management systems.

Procedure

This study was conducted at the NDSU Dickinson Research Extension Center, located in western North Dakota. Soils are primarily Typic Haploborolls. Average annual precipitation is 16.1 inches, with 13.6 inches (84.7%) falling as rain between April and October. Mean annual temperature is 40.8°F. January is the coldest month, with a mean temperature of 11.1°F. July and August are the warmest months, with mean temperatures of 68.6°F and 67.0°F, respectively. Mid October is generally considered to be the end of the growing season for perennial plants. Mean temperatures of October and November are 43.8°F and 28.3°F, respectively. October had water stress conditions 48.6% of the time during the past 111 years (1892-2002). Average precipitation in October and November is 0.94 inches and 0.54 inches, respectively (Manske 2003a).

Pasture-forage types of grazing management treatments were evaluated from mid October to mid November, during the fall portion of the grazing season, the 30-day period following the end of the growing season for perennial plants. Each of the grazing treatments had two replications. The native rangeland (NR) pasture-forage type is the Wheatgrass-Needlegrass Vegetation Type (Barker and Whitman 1988) of the mixed grass prairie. The dominant native range species are western wheatgrass, needle and thread, blue grama, and threadleaved sedge. The Altai wildrye (AW) domesticated grass pasture-forage type was seeded as a monoculture, but a small assortment of forb and other grass species developed as minor components. The cropland aftermath (CA) pasture-forage type consisted primarily of annual cereal residue of oat, barley, and/or chopped corn stubble.

Cow and calf weight performance data were collected on grazing management treatments involved in pasture research projects conducted between 1983 and 1998. Commercial crossbred cattle were used on all treatments. Individual animals were weighed on and off each treatment, at 15-day intervals, or at 30-day intervals during the latter portion of the grazing season. Weight performance of cows and of calves was calculated for each treatment, and differences between means were analyzed by a standard paired plot t-test (Mosteller and Rourke 1973). Portions of this data set were reported by Manske (1994a, b).

Grazing Management Treatments during the Fall

6.0-month seasonlong system

The 6.0-month seasonlong (6.0-m SL) management system continued livestock grazing during the fall portion of the grazing season, for 30 days from mid October to mid November, on a native rangeland pasture stocked at 4.04 acres per cow-calf pair per month. Livestock on this system grazed a single native rangeland pasture from mid May until mid November.

5.0-6.0-month seasonlong II system

The 5.0-6.0-month seasonlong II (SL 5.0-6.0-m II) management system continued livestock grazing during the fall portion of the grazing season, for 30 days from mid October to mid November, on a native rangeland pasture stocked at 2.53 acres per cow-calf pair per month. Livestock on this system grazed a single native rangeland pasture; livestock were turned onto the pasture between mid May and mid June and were removed in mid November.

4.5-month seasonlong system

The 4.5-month seasonlong (4.5-m SL) management system continued livestock grazing during the fall portion of the grazing season, for 30 days from mid October to mid November, on a cropland aftermath pasture stocked at 6.63 acres per cow-calf pair per month. Livestock on this system grazed an unfertilized crested wheatgrass pasture from early to late May and a native rangeland pasture from early June to mid October.

4.5-month seasonlong II system

The 4.5-month seasonlong II (SL 4.5-m II) management system continued livestock grazing during the fall portion of the grazing season, for 15 days from mid to late October, on a native rangeland pasture stocked at 3.26 acres per cow-calf pair per month. Livestock on this system grazed an unfertilized crested wheatgrass pasture from early May to mid June and a native rangeland pasture from mid June to late October.

4.0-month deferred system

The 4.0-month deferred (4.0-m Def) management system continued livestock grazing during the fall portion of the grazing season, for 30 days from mid October to mid November, on a native rangeland pasture stocked at 2.18 acres per cow-calf pair per month. Livestock on this system grazed an unfertilized crested wheatgrass pasture from early May to mid July and a native rangeland pasture from mid July to mid November.

4.5-month twice-over rotation system

The 4.5-month twice-over rotation (4.5-m TOR) management system continued livestock grazing for 30 days from mid October to mid November on an Altai wildrye pasture stocked at 1.39 acres per cow-calf pair per month. Livestock on this system grazed a fertilized crested wheatgrass pasture from early to late May and three native rangeland pastures in rotation from early June to mid October.

Results

Length of grazing period and acres per cow-calf pair for pasture-forage types during the fall portion of the grazing season are shown in table 1 for each grazing management system. Cow performance during the fall portion of the grazing season is shown in table 1 and figures 1, 2, and 3. Calf performance during the fall portion of the grazing season is shown in table 1 and figures 4, 5, and 6.

The stocking rate on the Altai wildrye pasture of the twice-over rotation system during the 30-day fall portion of the grazing season was 56.83% greater than the stocking rate on the fall native rangeland pasture of the deferred system, 134.56% greater than the stocking rate on the fall native rangeland pasture of the 4.5-month seasonlong II system, 377.06% greater than the stocking rate on the fall cropland aftermath pasture of the 4.5-month seasonlong system, 82.03% greater than the stocking rate on the fall native rangeland pasture of the 5.0-6.0-month seasonlong II system, and 190.68% greater than the stocking rate on the fall native rangeland pasture of the 6.0-month seasonlong system.

Grazing Management Systems

6.0-month seasonlong system

The 6.0-month seasonlong management system during the 30-day fall portion of the grazing season comprised a native rangeland pasture that livestock grazed from mid October to mid November. Cow weight performance on the native rangeland pasture was a loss of 52.20 lbs, at a rate of 12.90 lbs per acre and 1.74 lbs per day. Calf weight performance on the native rangeland pasture was a gain of 17.73 lbs, at a rate of 4.38 lbs per acre and 0.59 lbs per day.

5.0-6.0-month seasonlong II system

The 5.0-6.0-month seasonlong II management system during the 30-day fall portion of the grazing season comprised a native rangeland pasture that livestock grazed from mid October to mid November. Cow weight performance on the native rangeland pasture was a loss of 24.60 lbs, at a rate of 9.77 lbs per acre and 0.82 lbs per day. Calf weight performance on the native rangeland pasture was a gain of 27.60 lbs, at a rate of 10.90 lbs per acre and 0.92 lbs per day.

4.5-month seasonlong system

The 4.5-month seasonlong management system during the 30-day fall portion of the grazing season comprised a cropland aftermath pasture that livestock grazed from mid October to mid November. Cow weight performance on the cropland aftermath pasture was a loss of 48.17 lbs, at a rate of 7.27 lbs per acre and 1.61 lbs per day. Calf weight performance on the cropland aftermath pasture was a gain of 12.57 lbs, at a rate of 1.90 lbs per acre and 0.42 lbs per day.

4.5-month seasonlong II system

The 4.5-month seasonlong II management system during 15 days of the fall portion of the grazing season comprised a native rangeland pasture that livestock grazed from mid to late October. Cow weight performance on the native rangeland pasture was a loss of 7.74 lbs, at a rate of 4.75 lbs per acre and 0.52 lbs per day. Calf weight performance on the native rangeland pasture was a gain of 20.33 lbs, at a rate of 12.47 lbs per acre and 1.35 lbs per day.

4.0-month deferred system

The 4.0-month deferred management system during the 30-day fall portion of the grazing season comprised a native rangeland pasture that livestock grazed from mid October to mid November. Cow weight performance on the native rangeland pasture was a loss of 22.20 lbs, at a rate of 9.96 lbs per acre and 0.74 lbs per day. Calf weight performance on the native rangeland pasture was a gain of 23.10 lbs, at a rate of 10.36 lbs per acre and 0.77 lbs per day.

4.5-month twice-over rotation system

The 4.5-month twice-over rotation management system during the 30-day fall portion of the grazing season comprised an Altai wildrye pasture that livestock grazed from mid October to mid November. Cow weight performance on the Altai wildrye pasture was a gain of 16.50 lbs, at a rate of 11.87 lbs per acre and 0.55 lbs per day. Calf weight performance on the Altai wildrye pasture was a gain of 52.77 lbs, at a rate of 37.96 lbs per acre and 1.73 lbs per day.

Cow weight performance was greater on the Altai wildrye pasture of the twice-over rotation management system than on any of the five traditional management systems. Cows grazing the Altai wildrye pasture gained weight and cows grazing the native rangeland and cropland aftermath pastures of the five traditional management systems lost considerable weight during the fall portion of the grazing season. Cow accumulated weight on the deferred system was 234.6% lower than that on the twice-over system; the rate of gain was 183.9% lower per acre and 243.6% lower per day. Cow accumulated weight on the 4.5-month seasonlong II system was 146.9% lower than that on the twice-over system; the rate of gain was 140.0% lower per acre and 194.6% lower per day. Cow accumulated weight on the 4.5-month seasonlong system was 391.9% lower than that on the twice-over system; the rate of gain was 161.3% lower per acre and 392.7% lower per day. Cow accumulated weight on the 5.0-6.0-month seasonlong II system was 249.1% lower than that on the twice-over system; the rate of gain was 182.3% lower per acre and 249.1% lower per day. Cow accumulated weight on the 6.0-month seasonlong system was 416.4% lower than that on the twice-over system; the rate of gain was 208.7% lower per acre and 416.4% lower per day.

Calf weight performance was greater on the Altai wildrye pasture of the twice-over rotation management system than on any of the five traditional management systems. Calf accumulated weight on the twice-over system was 128.4% greater than that on the deferred system, with the rate of gain 266.4% greater per acre and 124.7% greater per day. Calf accumulated weight on the twice-over system was 159.6% greater than that on the 4.5-month seasonlong II system, with the rate of gain 204.4% greater per acre and 28.2% greater per day. Calf accumulated weight on the twice-over system was 319.8% greater than that on the 4.5-month seasonlong system, with the rate of gain 1897.9% greater per acre and 311.9% greater per day. Calf accumulated weight on the twice-over system was 91.2% greater than that on the 5.0-6.0-month seasonlong II system, with the rate of gain 248.3% greater per acre and 88.0% greater per day. Calf accumulated weight on the twice-over system was 197.6% greater than that on the 6.0-month seasonlong system, with the rate of gain 766.7% greater per acre and 193.2% greater per day.

Fall Pasture-Forage Types

Cows grazing native rangeland for 15 days (mid to late October) lost about 8 lbs, at a rate of 5 lbs per acre and 0.5 lbs per day. Cows grazing native rangeland for 30 days (mid October to mid November) lost about 22 lbs to 52 lbs, at a rate of 10 lbs to 13 lbs per acre and 0.7 lbs to 1.7 lbs per day. Cows grazing cropland aftermath for 30 days lost about 48 lbs, at a rate of 7 lbs per acre and 1.6 lbs per day. Cows grazing Altai wildrye for 30 days gained 16.5 lbs, at a rate of 12 lbs per acre and 0.55 lbs per day.

The Altai wildrye pasture of the twice-over rotation system was the only pasture-forage type on which cows gained weight during the fall portion of the grazing season. Cows lost weight during the fall portion of the grazing season on native rangeland and cropland aftermath pasture-forage types.

Calves on native rangeland for 15 days (mid to late October) gained about 20 lbs, at a rate of 12 lbs per acre and 1.35 lbs per day. Calves on native rangeland for 30 days (mid October to mid November) gained 18 lbs to 28 lbs, at a rate of 4 lbs to 11 lbs per acre and 0.6 lbs to 0.9 lbs per day. Calves on cropland aftermath for 30 days gained about 13 lbs, at a rate of 2 lbs per acre and 0.4 lbs per day. Calves on Altai wildrye for 30 days gained about 53 lbs, at a rate of 38 lbs per acre and 1.7 lbs per day.

Calves gained a small amount of weight during the fall portion of the grazing season on native rangeland and cropland aftermath pasture-forage types. The market value of the calf accumulated weight at $0.70 per pound is less than the rent costs of the native rangeland and cropland aftermath pastures. Calf weight gain on the Altai wildrye pasture-forage type of the twice-over rotation system was greater than calf weight gain on the native rangeland and crop aftermath pasture-forage types. The market value of the calf accumulated weight at $0.70 per pound is greater than the rent costs of the Altai wildrye pasture.

Table 1. Cow and calf performance during the fall portions of the grazing season on grazing management systems.

	6.0-M Seasonlong	5-6-M Seasonlong II	4.5-M Seasonlong	4.5-M Seasonlong II	4.0-M Deferred	4.5-M Twice-over Rotation
Fall	Native Rangeland	Native Rangeland	Cropland Aftermath	Native Rangeland	Native Rangeland	Altai Wildrye
Days	30	30	30	15	30	30
Acres	4.04	2.53	6.63	1.63	2.18	1.39
Cow						
Accumulated Wt	-52.20	-24.60	-48.17	-7.74	-22.20	16.50
Gain/Acre	-12.90	-9.77	-7.27	-4.75	-9.96	11.87
Gain/Day	-1.74	-0.82	-1.61	-0.52	-0.74	0.55
Calf						
Accumulated Wt	17.73	27.60	12.57	20.33	23.10	52.77
Gain/Acre	4.38	10.90	1.90	12.47	10.36	37.96
Gain/Day	0.59	0.92	0.42	1.35	0.77	1.73

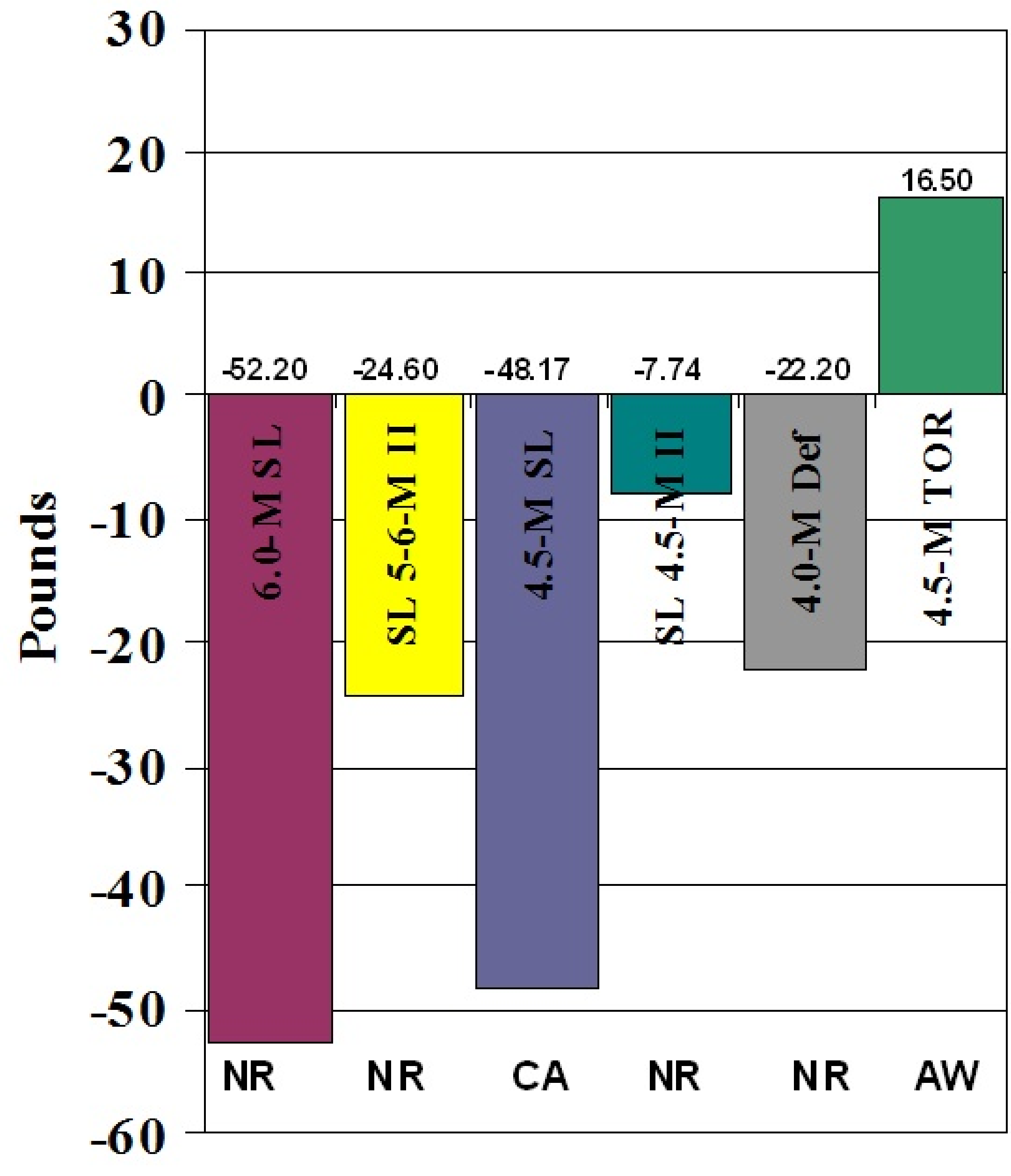

Fig. 1. Cow accumulated weight on grazing management systems during the fall portion of the grazing season.

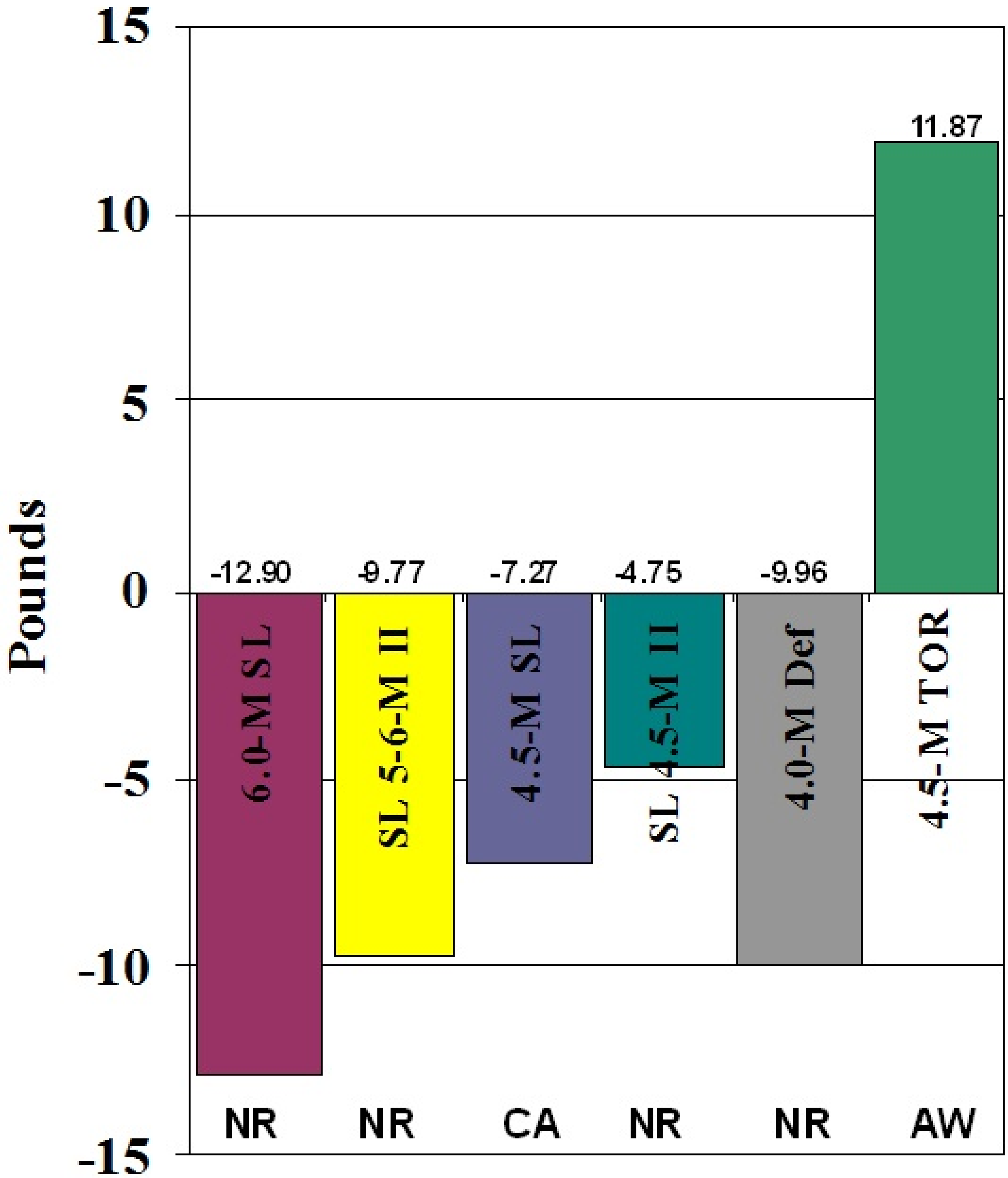

Fig. 2. Cow weight gain per acre on grazing management systems during the fall portion of the grazing season.

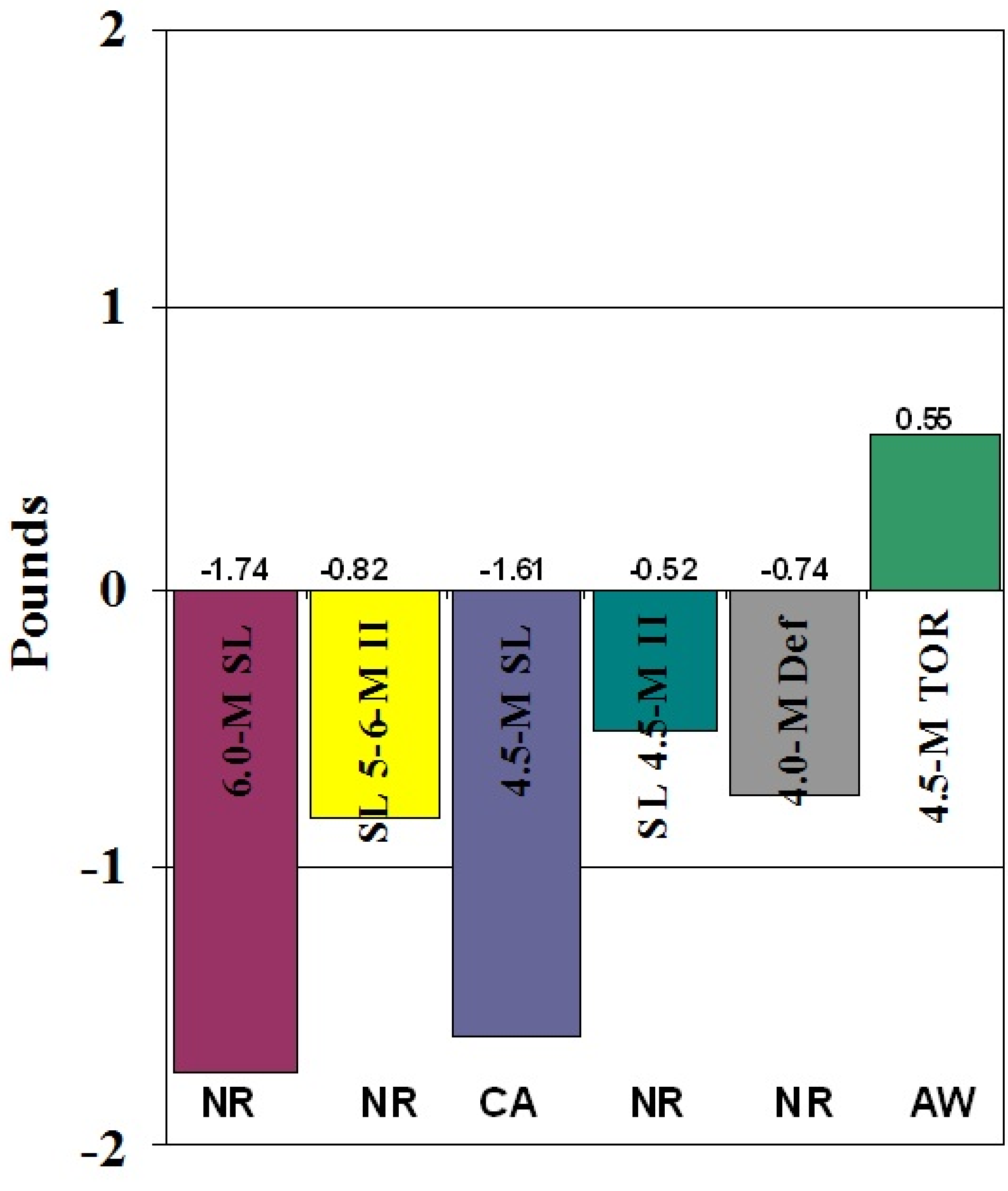

Fig. 3. Cow weight gain per day on grazing management systems during the fall portion of the grazing season.

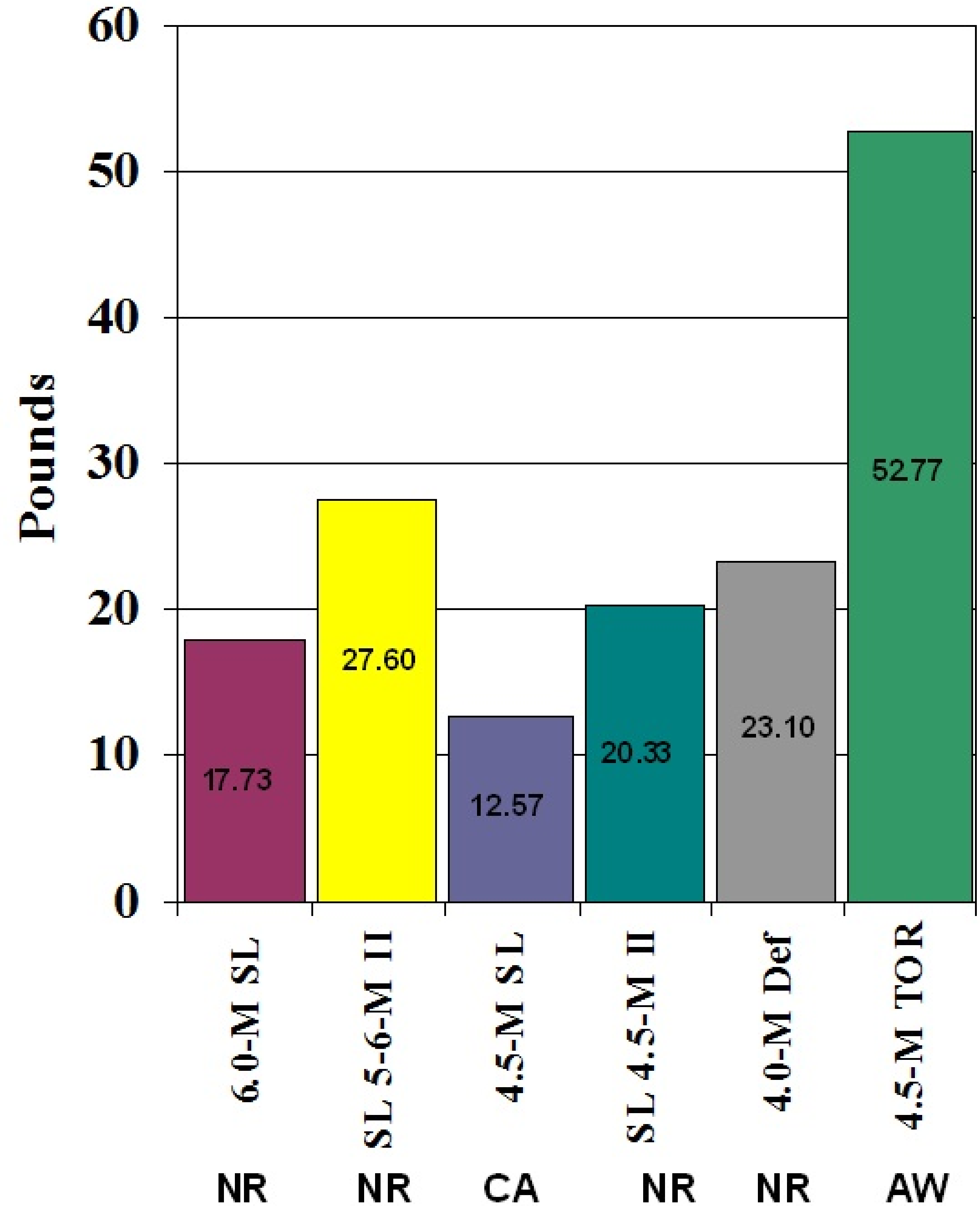

Fig. 4. Calf accumulated weight on grazing management systems during the fall portion of the grazing season.

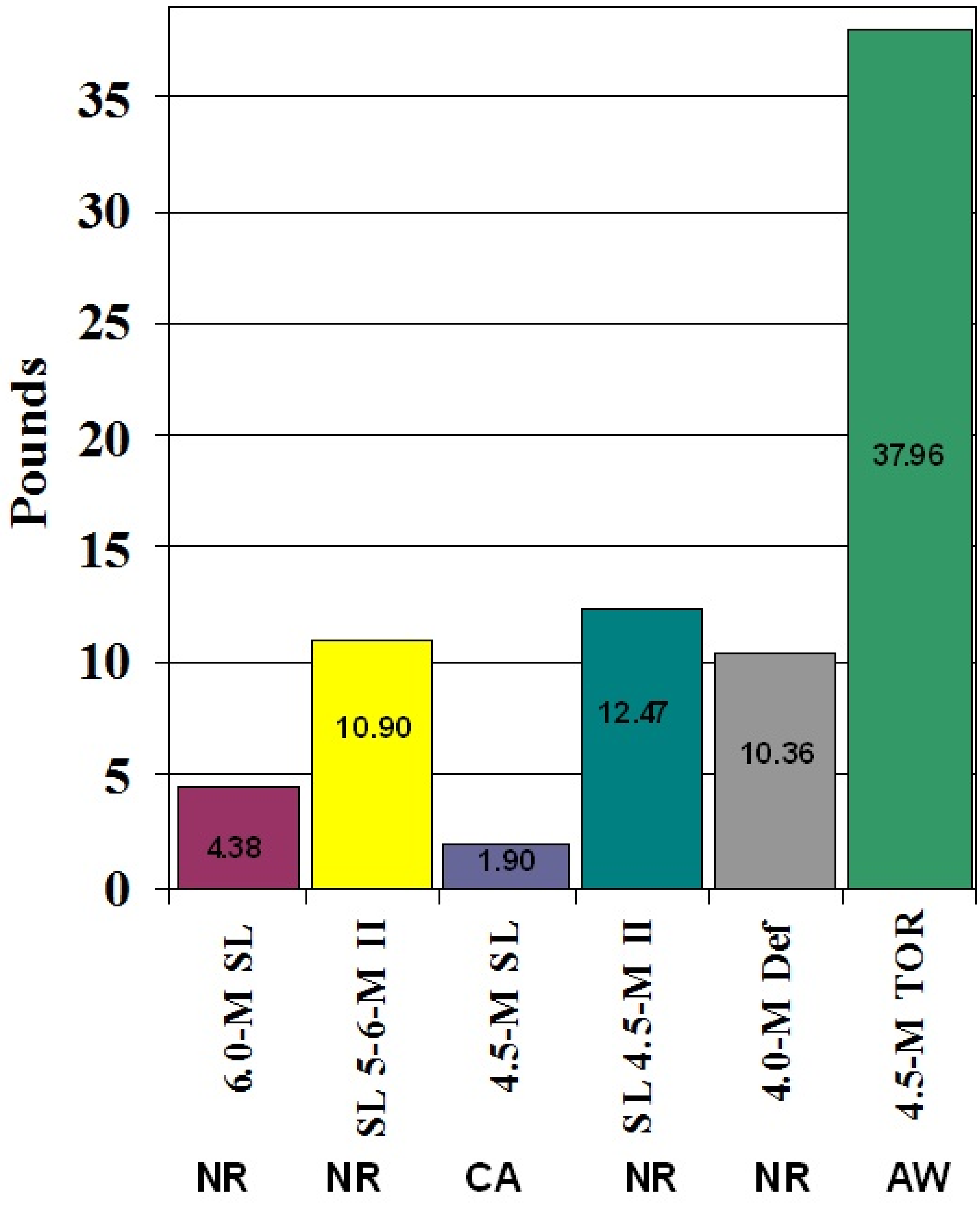

Fig. 5. Calf weight gain per acre on grazing management systems during the fall portion of the grazing season.

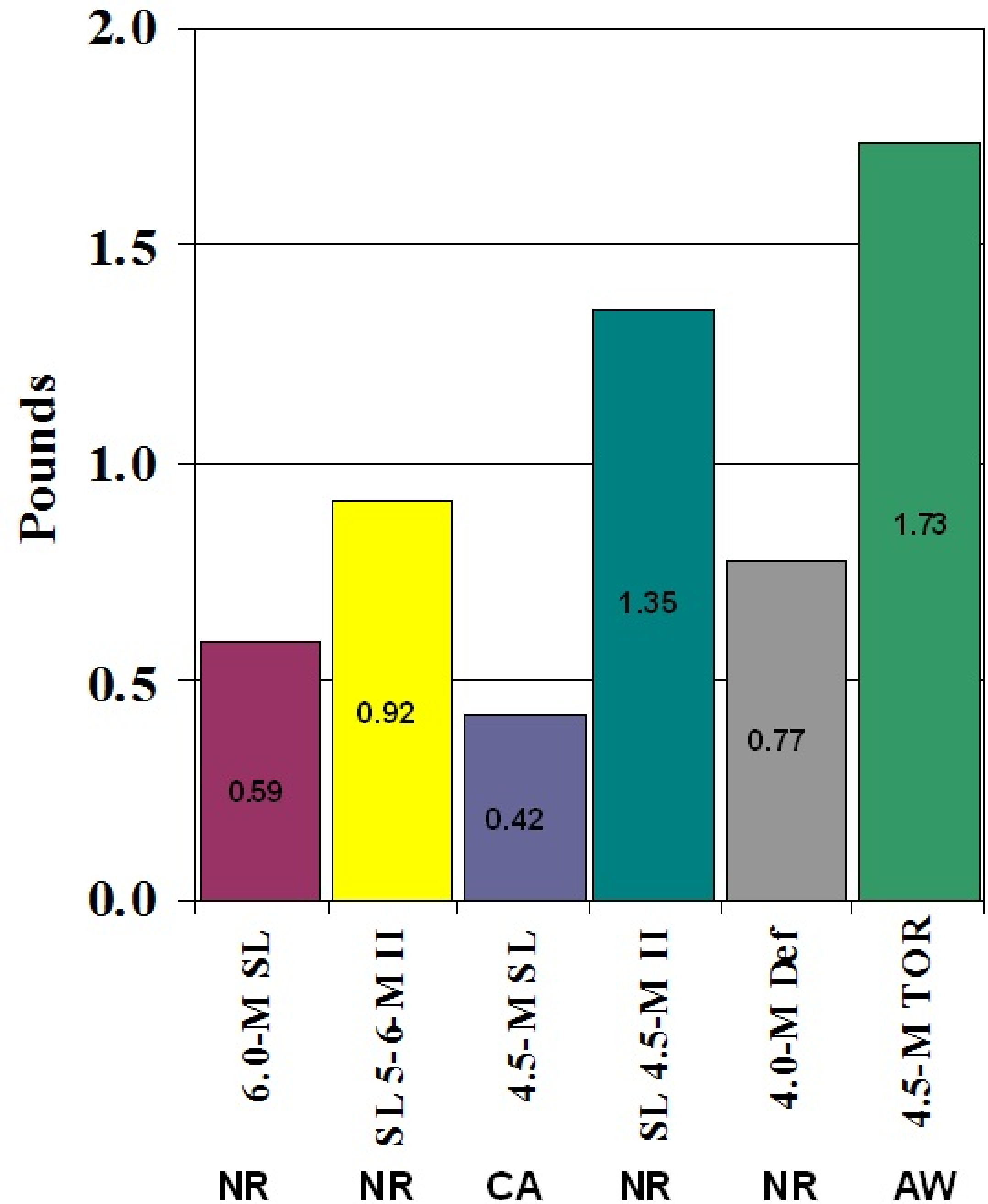

Fig. 6. Calf weight gain per day on grazing management systems during the fall portion of the grazing season.

Discussion

Extending the grazing season about a month beyond the end of the growing season for perennial plants, which usually occurs around mid October, requires use of pasture-forage types that have sufficient nutrient quality to meet livestock dietary requirements and sufficient herbage quantity to permit efficient capture of a relatively high proportion of the produced nutrients from the land base. Cow and calf weight performance should be near potential gains, and market value of calf accumulated weight during the fall portion of the grazing season should be greater than the rent and production costs of the fall pasture-forage.

Northern Plains cattle producers typically make management decisions about the fall portion of the grazing season with little solid information. Most beef producers can infer from experience a close approximation of the weight of calves when they go out to pasture in the spring, and, if the calves are sold at weaning, the producers know about the average weight of calves when they come off pasture in the fall. The difference between the two estimated weights gives producers a general idea of calf weight performance across the entire grazing season. When animal performance during spring, summer, and fall is averaged, cows appear to gain a small amount of weight and calf weight gains appear to be satisfactory only because comparisons to potential animal weight gains are not available. Most livestock producers know that animal weight gains are lower during the fall than during the early portion of the grazing season. The extent of this reduction in performance is not obvious, and the actual amount of the reduction in animal performance during the fall is not known from averaged seasonal gains. Lack of this information is easily dismissed as having little importance by producers making fall management decisions when it is viewed with the assumption that production costs are lower when cows and calves graze as long as possible.

Basing their management plans on the supposition that fall grazing reduces beef production costs, Northern Plains livestock producers attempt to extend the grazing season about a month beyond mid October. Traditional grazing management systems commonly graze native rangeland or cropland aftermath pasture-forage types during the fall portion of the grazing season. Grazing mature plant residue of these fall pasture-forage types is widely accepted to be low-cost and assumed to be considerably less expensive than feeding harvested forage. Few beef producers have questioned these presumptions, and very few beef producers weigh livestock mid season to separate the late-season weight performance from the early season weight performance.

Cow and calf weight gain performance during the fall portion of the grazing season on traditional grazing management systems is far below the animals' genetic growth potentials. Cows lose a great deal of weight--from around a quarter to two-thirds of a body condition score in a month. Calves gain very little weight--only around 25% to 40% of their potential weight gain. The reductions in weight performance of livestock grazing traditional pasture-forage types during the fall portion of the grazing season result from decreases in the quantity and nutritional quality of the herbage.

Cropland aftermath pastures almost always have low quantities of herbage present, and the nutrient content of stubble from annual cereals harvested for grain is extremely low. Unless the crop aftermath pasture contains a substantial quantity of spouted grain, lactating cows cannot find forage that meets their crude protein requirements, and the result is a loss of considerable weight and a great reduction in calf weight gain.

The weight of the fall herbage on native rangeland pastures that have not been previously grazed is only about 40% to 60% of the mid summer herbage weight on ungrazed grasslands. The weight of the fall herbage on previously grazed native rangeland pastures is considerably less than 50% of the potential peak herbage biomass. The summer stocking rates on traditional management systems are not adjusted after mid October to reflect the reduction in fall aboveground herbage biomass, and this failure causes part of the problem in reduced livestock weight performance during the fall portion of the grazing season.

Nutritional quality of native rangeland grasses decreases rapidly following the flowering stage, and the quality falls below the crude protein requirements of a lactating cow around mid July to early August. Nutritional quality of herbage consisting primarily of maturing lead tillers continues on a sharp decline until the end of the grazing season. Native rangeland herbage during the fall has a crude protein content of around 4.8%, about half the content of mid summer herbage. Cows grazing herbage with nutrient content below their dietary requirements draw on stored body fat to provide for a portion of their milk production, and their weight decreases. The loss of weight leads to decreased milk production, which results in reduced calf weight gain per day.

Grazing during the fall causes not only decreased livestock performance that season but also biological problems for perennial plants and reduced pasture performance in the following growing season. Grazing that removes leaf area from overwintering tillers during the fall deprives tillers developing spring growth of a major source of nutrients and increases the demand on low levels of carbohydrate reserves. The result is a reduction of herbage weight produced during the succeeding growing season. Fall grazing damages perennial grasses, decreasing plant vigor and reducing leaf height 28% during the next growing season (Goetz 1963, Manske 2003b). The popular belief that perennial grasses will not be harmed by grazing after a frost is not consistent with the biology of grass growth and should not be used as a foundation for grazing management decisions because of the resulting reductions in grass production and increases in grazingland-forage costs the following year.

If grazing on native rangeland occurs after mid October, it should take place on reserve fall pastures that have been separated from the summer pasture system and have grasses with stimulated secondary tiller growth. Land area per month required for a range cow on reserve native rangeland pastures during the fall portion of the grazing season is about double the land area required per month during the growing season. Native rangeland that would require 2.5 acres per month for a lactating cow during the summer would require 4.2 acres per month during late October and 5.0 acres per month during early November.

Stimulation of secondary tillers by light grazing for 7 to 17 days on each pasture during the period between the third new leaf stage and the flowering stage (early June to mid July) can improve livestock weight performance on native rangeland two to two and a half months, until late September or mid October. The biology of native grass plants does not permit extending this improved performance beyond mid October, when nutritional quality of herbage on native rangeland falls too low to meet requirements of lactating cows.

Pasture-forage types that meet the nutritional requirements of lactating cows after mid October include Altai and Russian wildryes. The wildryes are the only perennial grasses that retain nutrient quality in the aboveground portions until around mid November. No perennial grass in the Northern Plains retains sufficient nutritional quality to dependably meet the nutritional requirements of lactating cows later than mid November. Cows grazing Altai wildrye pastures during mid October to mid November gained weight and the calves gained considerably more weight than calves on traditionally managed native rangeland and cropland aftermath pastures.

The traditional pasture-forage management strategies used in the Northern Plains were developed during the era of low-performance livestock. During the past several decades, the type of livestock in the region has shifted to a fast-growing, high-performance animal, but pasture-forage management practices have not been changed to meet the requirements of the modern livestock and take full advantage of their genetic growth potential. The use of slightly modified low-performance pasture-forage management strategies with high-performance livestock results in calves with weaning weights below potential and in high annual expenses for cow maintenance.

Biologically effective pasture-forage management strategies combine different pasture-forage types and graze each type at optimum times so that herbage production curves and nutritional quality curves coordinate with the dietary quantity and quality requirements of lactating cows during the entire grazing season. Such management strategies result in improved livestock weight performance, reduced livestock production costs, and increased profit margins.

Conclusion

Cows and calves do not gain weight at the same rate during the latter portion of the grazing season as they do during the early portion of the grazing season. Herbage quantity and quality decline as plants mature. The seasonal pattern of plant growth and maturity varies with pasture-forage types and can be modified by differing effects that grazing management practices have on plant growth.

Extending the grazing season one month beyond the end of the growing season for perennial plants on traditionally managed pasture-forage types does not reduce feed cost and greatly reduces livestock weight performance from potential weight gains. Grazing during the fall period on pasture-forage types that meet livestock dietary quantity and quality requirements produces near-potential animal weight gains.

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