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Grazing Before Grass Is Ready

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Grassland herbage production can be sustained at relatively high levels only when grass plants retain adequate leaf area. Heavy grazing of native range pastures that repeatedly removes a great proportion of the leaf area has long been known to cause reductions in grassland herbage production. Grazing during early spring prior to range readiness also deprives grass plants of needed leaf area and results in reductions in grass growth, herbage production, and economic returns. The reductions in herbage production and in economic returns vary with grazing starting date and grazing strategies. These reductions in herbage production and economic returns are quantified in this report.

Methods

Data reported by Campbell (1952) from a four-year grazing study conducted at Swift Current, Saskatchewan, and data reported by Rogler et al. (1962) and Lorenz (per. com.) from a four-year clipping study conducted at Mandan, North Dakota, were summarized, and the amounts of herbage produced on treatments with defoliation starting at various dates were compared to the potential aboveground herbage biomass. Data collected during grazing studies conducted from 1982 to 1987 at Dickinson, North Dakota, were used to compare herbage production, animal performance, and economic net returns (gross minus pasture and forage costs) for three grazing strategies: 1) a seasonlong treatment with grazing starting 15 May, 2) a seasonlong treatment with grazing starting 15 June, and 3) a three-pasture twice-over rotation grazing system with grazing starting 1 June.

Results

Percent reductions from the potential herbage biomass that are caused by defoliation treatments with different starting dates are shown in Table 1 and Fig. 1. The percentages of the reductions in herbage biomass at Swift Current, Mandan, and Dickinson are quite similar for the various defoliation starting dates. These reductions in herbage biomass show that when grazing on native range is started in early May, more than 75% of potential herbage biomass will not be produced. When grazing is started in mid May, 45% to 60% of the potential herbage biomass will not be produced and will not be available for grazing livestock. When the starting date of grazing is between early June and early July, the reductions from potential herbage biomass are not great. When the starting date of grazing is delayed until early July, nearly all of the potential herbage biomass will grow and be available to grazing livestock, but the nutritional quality of the herbage will be at or below crude protein levels required for lactating cows (Whitman et al. 1951, Manske 1999b). When the starting date is deferred until mid July, after plants have produced seed, less than potential herbage biomass will be available to grazing livestock because of senescence and the translocation of cell material to belowground plant structures. The nutritional quality of the herbage on deferred grazing strategies will be below the crude protein requirements for lactating cows (Whitman et al. 1951, Manske 1999b), individual cow and calf performance will be reduced (Manske 1994), and net return per cow-calf pair will be 15% lower than net return per cow-calf pair on the seasonlong treatment with grazing starting 15 June, after the third-leaf stage (Manske 1996). The major long-term problem with a deferred management strategy that starts grazing after grass seed development is the reduction in native-grass basal cover (Sarvis 1941, Manske et al. 1988). Data from these native range defoliation studies indicate that starting grazing between early June and early July causes the least reduction in herbage production, herbage nutritional quality, and grass plant density.

The phenological growth stage of grass plants can be used as an indicator of when grazing can be started without detriment to plant health and herbage production. Grass plants are physiologically capable of tolerating grazing pressure after they have reached the 3.0- or 3.5-leaf stage (Manske 1999a). Grazing grass plants that have not reached the third-leaf stage negatively affects grass growth. Grazing grass plants after they have reached the third-leaf stage and before they have reached the flowering stage stimulates vegetative tiller production from axillary buds and subsequently increases herbage biomass production (Manske 1994). Most native cool-season grasses reach the third-leaf stage around early June, and most native warm-season grasses reach the third-leaf stage around mid June (Manske 1999a). Seasonlong grazing management strategies on native range should delay grazing until mid June, but rotation grazing systems that are based on grass biological requirements and that stimulate tiller growth from axillary buds could start grazing in early June.

Starting grazing before the third-leaf stage, as does the seasonlong treatment with grazing starting 15 May, causes a reduction in herbage biomass production (-45% (table 1)), which causes reductions in stocking rate (-29%), calf average daily gain (ADG) (-14%), and calf gain per acre (-40%) compared to stocking rate, calf average daily gain, and calf gain per acre on the seasonlong treatment with grazing starting after the third-leaf stage (table 2). This reduction in animal performance causes a decrease in net returns (gross minus pasture and forage costs) per cow-calf pair (-80%) and per acre (-89%) compared to net returns per cow-calf pair and per acre on the seasonlong treatment with grazing starting after the third-leaf stage (table 2). The seasonlong treatment with grazing starting after the third-leaf stage has greater animal performance and higher economic returns than does the seasonlong treatment with grazing starting before the third-leaf stage because starting grazing after the third-leaf stage results in less damage to grass plants and allows greater production of herbage biomass (-21% (table 1)). The seasonlong treatment with grazing starting after the third-leaf stage has reductions in stocking rate (-29%), calf average daily gain (-6%), calf gain per acre (-33%), net returns per cow-calf pair (-33%), and net returns per acre (-53%) compared to stocking rate, calf average daily gain, calf gain per acre, and net returns per cow-calf pair and per acre on the twice-over rotation treatment with grazing starting after the third-leaf stage (table 2). The twice-over rotation system with grazing starting after the third-leaf stage also has grazing periods designed to coordinate with grass phenological development and to meet the biological requirements of grass plants (Manske 1999a) and grazing animals (Manske 1994). The twice-over rotation system has increased stocking rate (+49%, +29%), calf average daily gain (+19%, +6%), calf gain per acre (+60%, +33%), net returns per cow-calf pair (+86%, +33%), and net returns per acre

(+95%, +53%) compared to stocking rate, calf average daily gain, calf gain per acre, and net returns per cow-calf pair and per acre on the seasonlong treatments with grazing starting before and after the third-leaf stage, respectively (table 2). Grazing systems designed to meet the requirements of plants and animals have greater herbage biomass production and better animal performance than other systems. Grazing systems that rotate livestock in an arbitrary sequence that is not coordinated with grass plant phenological development and that does not meet the biological requirements of the plants and animals do not produce satisfactory results.

Discussion

The amount of herbage biomass produced on grasslands decreases when plants are defoliated before the third-leaf stage. The earlier defoliation is started the greater the decrease in herbage production. Early spring growth depends both on carbohydrate reserves and on photosynthetic products from the active leaf area of the tiller. Before the third-leaf stage, the plant has little leaf area and low carbohydrate levels. Defoliation of the plant at this time results in reduced rates of herbage production (Coyne et al. 1995) because the plant produces little photosynthetic product and must depend upon stored carbohydrates, which are usually not adequate for complete recovery of growth. This early spring damage causes a reduction in herbage biomass production for the entire growing season. The reduction in herbage biomass reduces stocking rate and animal performance and results in lower economic returns per cow-calf pair and per acre.

Sustaining high levels of herbage production on grasslands requires that grazing not begin before the plants have reached the 3.0- or 3.5-leaf stage. Delaying grazing on native range until 1 June, when cool-season grasses reach the third-leaf stage, requires that another type of forage be available for grazing earlier. Some domesticated perennial cool-season grasses reach the third-leaf stage three to five weeks earlier than native cool-season grasses and can be grazed as complementary spring pastures before native range reaches grazing readiness. Domesticated cool-season grass pastures like crested wheatgrass or smooth bromegrass can be grazed from early May, after they have reached the third-leaf stage, to early June, when native cool-season grasses reach the third-leaf stage. Like native range, complementary spring domesticated grass pastures should be grazed only after plants have reached the third-leaf stage. The start of the grazing season on domesticated grass pastures is restricted to very late April or early May, because no perennial grasses in the Northern Great Plains reach the third-leaf stage before late April.

Summary

Grazing native range before the grass plants reach the third-leaf stage causes reductions in herbage biomass production and subsequent reductions in stocking rate and animal performance. These reductions result in lower economic returns for a livestock operation. Herbage biomass production can be increased, along with stocking rate, animal performance, and net returns, when grazing is started after the third-leaf stage. Herbage production can be further increased when grazing started after the third-leaf stage is coordinated with grass phenological growth to meet the biological requirements of the grass plants. With such management, stocking rate, calf average daily gain, calf gain per acre, net returns per cow-calf pair, and net returns per acre will also increase.

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Table 1. Percent reduction from potential aboveground herbage biomass on defoliation treatments with different starting dates.

Starting dates of defoliation	Swift Current[a] grazing data	Mandan[b] clipping data	Dickinson grazing data
1 May	-78%	-76%	-
15 May	-46%	-57%	-45%
1-5 Jun	-13%	-43%	-
15-20 Jun	-7%	-33%	-21%
1-5 Jul	0%	-8%	-
15-20 Jul	-18%	0%	0%
1 Aug	-	-13%	-

[a]Campbell 1952
[b]Rogler et al. 1962
[b]Lorenz (per. com.)

Table 2. Comparisons of costs, production, and net returns on native range managed by seasonlong and twice- over rotation grazing systems with grazing starting before and after the 3rd leaf stage.

		Seasonlong starting before 3rd leaf	Seasonlong starting after 3rd leaf	Twice-over Rotation starting after 3rd leaf
Stocking rate (acres/AUM)	(ac)	4.04	2.86	2.04
Calf ADG	(lb)	1.80	2.09	2.21
Calf gain/acre	(lb)	13.59	22.55	33.64
Pasture cost/cow/calf pr				

@$8.76/ac	($)	212.34	111.25	78.84
Cost/lb calf gain	($)	0.64	0.39	0.26
Net return/cow/calf pr				
@$0.70/lb	($)	18.24	89.18	133.10
Net return/acre@$0.70/lb	($)	0.75	7.02	14.79

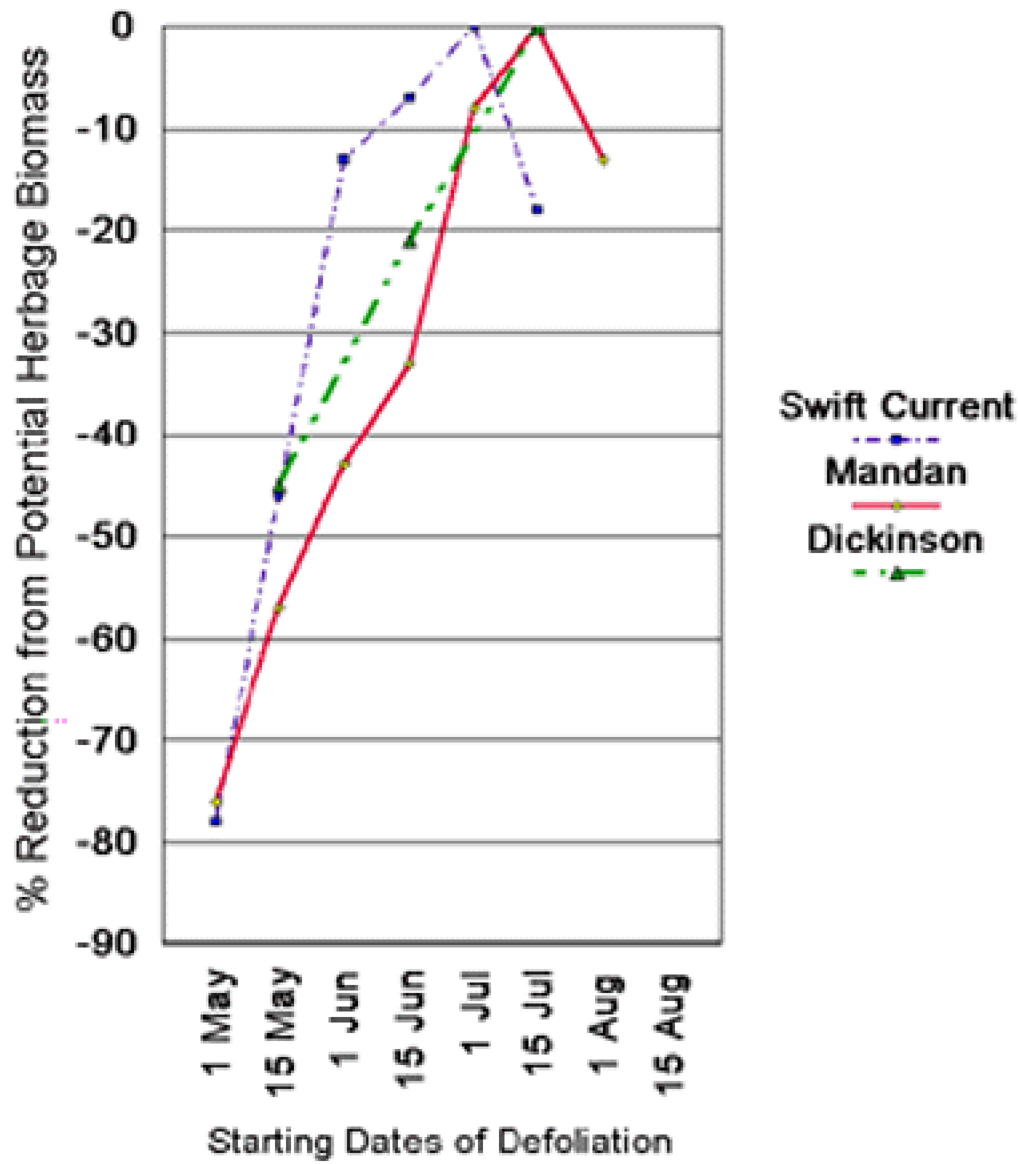

Fig. 1. Percent reduction from potential aboveground herbage biomass on defoliation treatments with different starting dates.

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