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Abstract

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Keywords

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Stocking Rate Effects on Intensive-Early Stocked Bluestem Range

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Summary

Based on a six-year study, stocking at 2.5X and 3.0X normal season-long rates for the first half of the growing season with no grazing during the latter half results in individual steer gains that are equal to those under the 2.0X rate. The gain per acre was greatly increased at the higher stocking rates. Grass remaining in early October was 20 percent lower on pastures stocked at the 2.5X and 3.0X rates than at the 2.0X rate. However, there was no trend toward further reductions over the study period. Botanical composition did not change greatly as a result of the different stocking rates. Apparently, Flint Hills bluestem range can be intensive-early stocked at rates higher than the traditional 2.0X rate.

Introduction

The high-quality forage period for warm-season perennial grasslands is relatively short. Grazing at other times results in livestock gains that are sub-optimal. Forage quality does not meet optimal growth requirements. The goal of any rangeland-based program for growing livestock should be maximum efficiency in converting forage to animal product. Earlier work showed an increased conversion efficiency with intensive-early stocking of Kansas Flint Hills range; that is, stocking density was twice normal for the first half of the growing season. Slightly more than 1000 lb per acre of herbage remained when livestock were removed in mid-July. Lack of grazing from mid-July until frost allowed for adequate storage of reserve carbohydrates. Since there was substantial herbage remaining when livestock were removed, the next study was to determine if higher stocking rates could be attained.

We studied the effects of stocking densities on Kansas Flint Hills bluestem range at 2, 2.5, and 3 times the normal season-long rate from May 1 to mid-July on botanical composition, herbage yield, reserve carbohydrates, and animal gains.

Materials and Methods

Study Area. The study area was six 60-acre late-spring burned pastures in the northern Kansas Flint Hills near Manhattan, KS on the Kansas State University Experimental Range Unit. Big bluestem (Andropogon gerardii Vitman.) and indiangrass (Sorghastrum nutans Nash) were the dominants. Little bluestem (A. scoparius Michx.) and sideoats grama [Bouteloua curtipendula (Michx.) Torr.] were sub-dominants. Numerous grass, forb, and woody species constituted the remainder. Soils were transitional from udic ustolls to udolls. The principal range sites in the study area were loamy upland, breaks, and clay upland.

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Cattle. Each year on May 1 from 1982 through 1987, the pastures were stocked with yearling steers weighing 500 to 575 lb. Stocking rates of 1.75 (2X), 1.50 (2.5X), and 1.25 (3X) acres per steer were applied in duplicate on the six study pastures. Steers were individually identified and weighed on April 30 and July 16 each year. Steers were confined without feed and water from the afternoon of the day prior to weighing until they were weighed the following morning.

Herbage Production. Herbage remaining following grazing was clipped to ground level between July 16 and 20 each year on 10, 4.36 ft^2-plots in both loamy upland and breaks range sites. Regrowth was clipped using the same procedure in early October. Herbage was separated into grasses and forb-brush components, dried to moisture-free, and weighed.

Botanical Census. Botanical composition and basal cover were estimated using the modified step-point method. Pastures were sampled annually during the first half of June. Within each pasture, 1,500 points were read along a predetermined grid. Each point was recorded as to range site. Pretreatment botanical composition and basal cover were determined in 1981 and analysis of variance was conducted on the change from pretreatment levels.

Results and Discussion

Precipitation. Growing season precipitation during the initial year of the study was above normal (Figure 12.1), but precipitation during the latter half of the growing season during 1983 and 1984 was well below normal. In remaining years (1985-87), precipitation was normal, to above normal, with only July, 1987 lacking in adequate moisture for growth.

Grass Production: Mid July. Grass production (lb/acre) remaining (GR) at the time of livestock removal varied among years (Figure 12.2). During most years, GR was greater for the 2X rate on both major range sites than for the 2.5X and 3X rates. In two of the six years, GR was greater on the 2.5X rate pastures than on the 3X, but was similar during the other four years. In 1985, there appeared to be no difference in GR among pastures stocked at different rates. During the latter half of the 1983 and 1984 growing seasons there was essentially no regrowth on any treatment pasture because of insufficient precipitation. This probably accounted for the reduced herbage production during early season 1985. Even though there was substantial yearly variation in GR at livestock removal, there appeared to be no downward trend at any stocking rate indicating that sustained herbage production was possible at any of the rates tested.

Grass Production: October. GR on both major range sites in early October was greater on pastures with the 2.0X stocking rate (1904 lb/acre) than on pastures stocked at the 2.5X (1465 lb/acre) and the 3.0X rate (1537 lb/acre) which were essentially equal in GR. GR in early October varied over years in response to variable climate, but there was no downward trend under any stocking rate (Figure 12.2). It appears that the amount of grass remaining in October under each stocking rate can be sustained over a long period.

Forb Production. Forb production (lb/acre) remaining (FR) in July and October following grazing was similar under all stocking rates except in 1982 and 1985. In those years, FR was higher on pastures stocked at the 3.0X rate (Figure 12.3).

Botanical Census. There was little change in botanical composition among pastures stocked at different rates. On the loamy upland site, indiangrass percent composition at the end of the study was substantially lower under the 2.5X and 3.0X stocking rates compared to 1982 levels (Figure 12.4). On the breaks site, indiangrass percent composition was reduced from initial levels only on pastures stocked at the 2.5X rate (Figure 12.5). Kentucky bluegrass (Poa pratensis L.) percent composition in 1987 was higher on the loamy upland range site under the 3.0X stocking rate than at the beginning of the study (Figure 12.4). The increased relative amount of Kentucky bluegrass on pastures stocked at the 3.0X rate compared to lower rates likely resulted from lower fire intensity because of reduced amounts and continuity of the fuel. Big bluestem percent composition on the breaks site increased compared to initial levels on pastures stocked at the 2.0X stocking rate but did not change greatly under the higher stocking rates (Figure 12.5).

Previous research has shown that big bluestem is favored by intensive-early stocking at the 2.0X rate compared to season-long stocking. The changes in botanical composition at the different stocking rates were relatively minor, particularly for the 2.0X and 2.5X rates. At the 3.0X rate, the reduction in percent composition of indiangrass and the increase in Kentucky bluegrass, though relatively small, indicate potential long-term undesirable changes.

Steer Gains. Even though they varied among years, steer gains on pastures stocked at different rates were the same for any given year (Table 12.1). Differences in steer gains among years were likely due to changes in type of cattle utilized in the study. In 1982 and 1983, steers were purchased through local sale barns and largely represented average frame, British crossbred cattle. From 1984 through 1987, steers were from a single source, possessed larger frame size, and were British X Zebu crosses.

From an individual steer gain standpoint, stocking at any of the rates tested will give equal performance; however, the gain per acre will be substantially increased at higher stocking rates. Compared to traditional season-long stocking with per acre gains of 68 lb on unburned pastures and 78 lb on burned, there is a substantial increase in gain per acre under intensive-early stocking without increased production costs.

Table 12.1. Influence of Stocking Rate on Steer Gains on Kansas Flint Hills Bluestem Pastures Intensive-early Stocked from 1 May to 15 July, 1982-1987. Stocking Rates were 1.75 acres/steer (2.0X), 1.50 acres/steer (2.5X), and 1.25 acres/steer (3.0X)

	Gains (lb/steer)			Gains (lb/acre)		
Year	2.0X	2.5X	3.0X	2.0X	2.5X	3.0X
1982	139	128	137	79	85	110
1983	133	122	137	76	81	110
1984	166	166	168	119	123	134
1985	208	184	175	119	123	156
1986	185	190	195	106	127	156
1987	178	182	187	101	121	145
Average	168	162	166	96	108	133

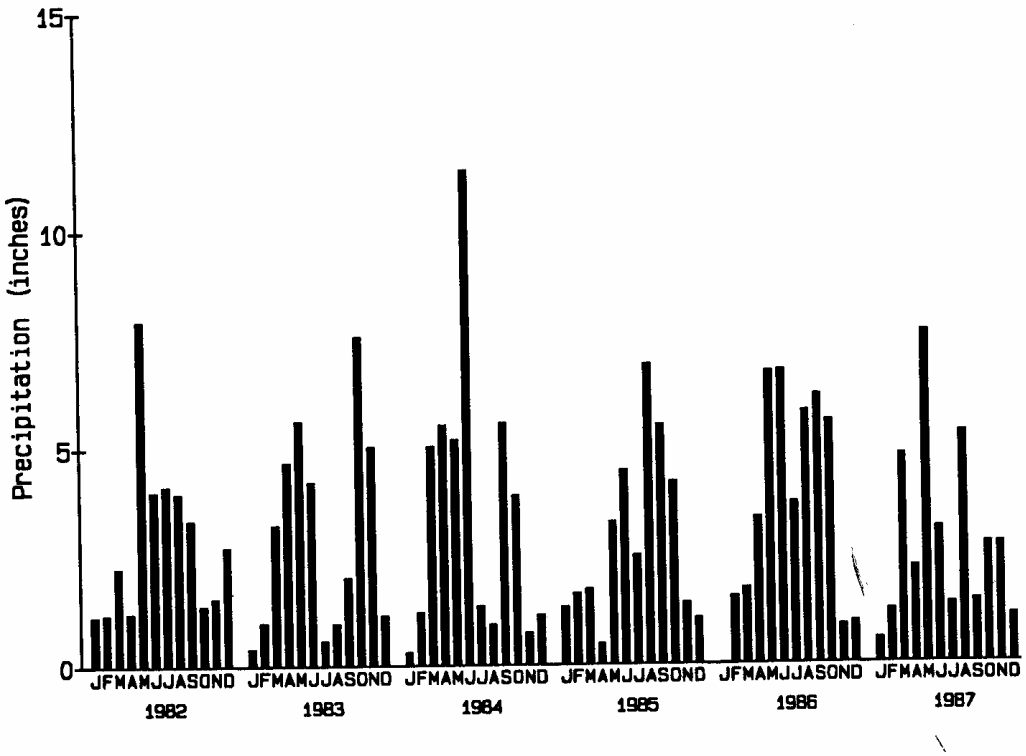

Figure 12.1. Monthly precipitation for Manhattan, KS from 1982-1987.

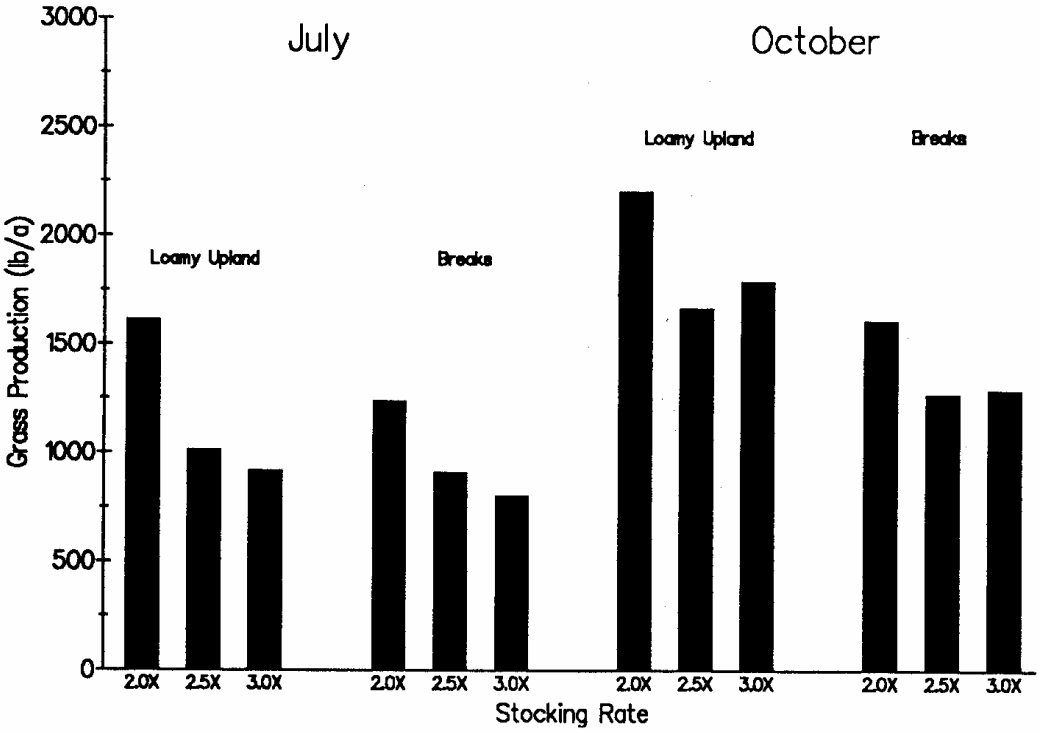

Figure 12.2. Grass production remaining (lb/a) for pastures stocked at 2, 2.5, and 3 times normal season-long stocking rates. Harvest dates were in mid July and early October. 1982-1987 average.

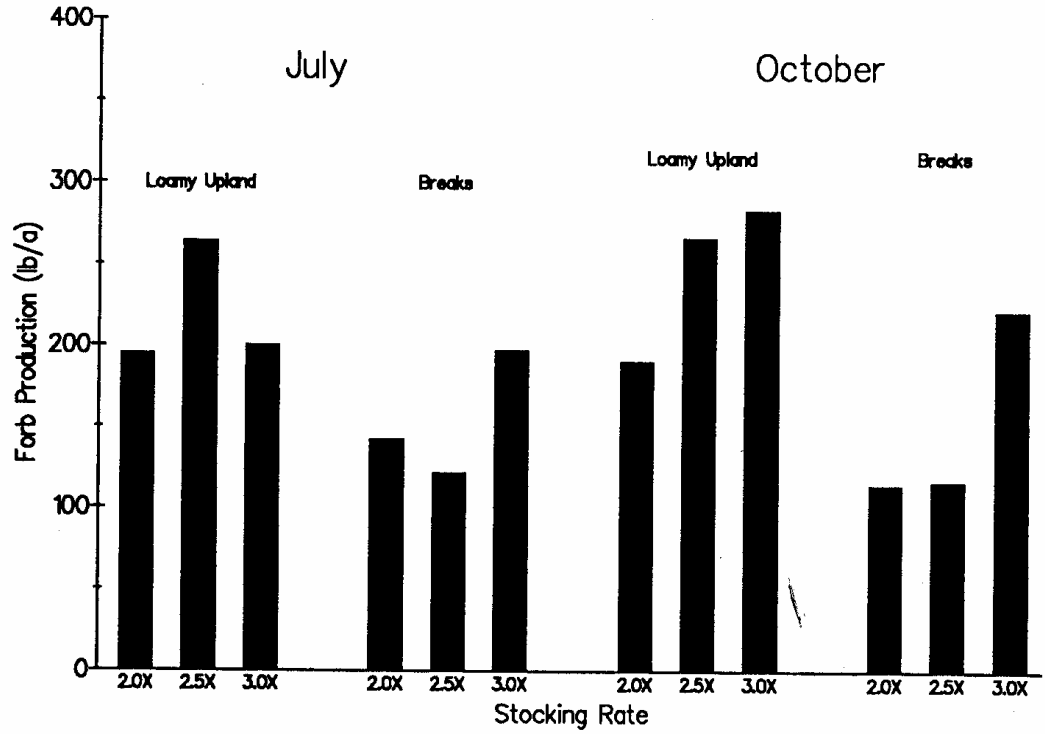

Figure 12.3. Forb production remaining (lb/a) for pastures stocked at 2, 2.5, and 3 times normal season-long stocking rates. Harvest dates were in mid July and early October. 1982-1987 average.

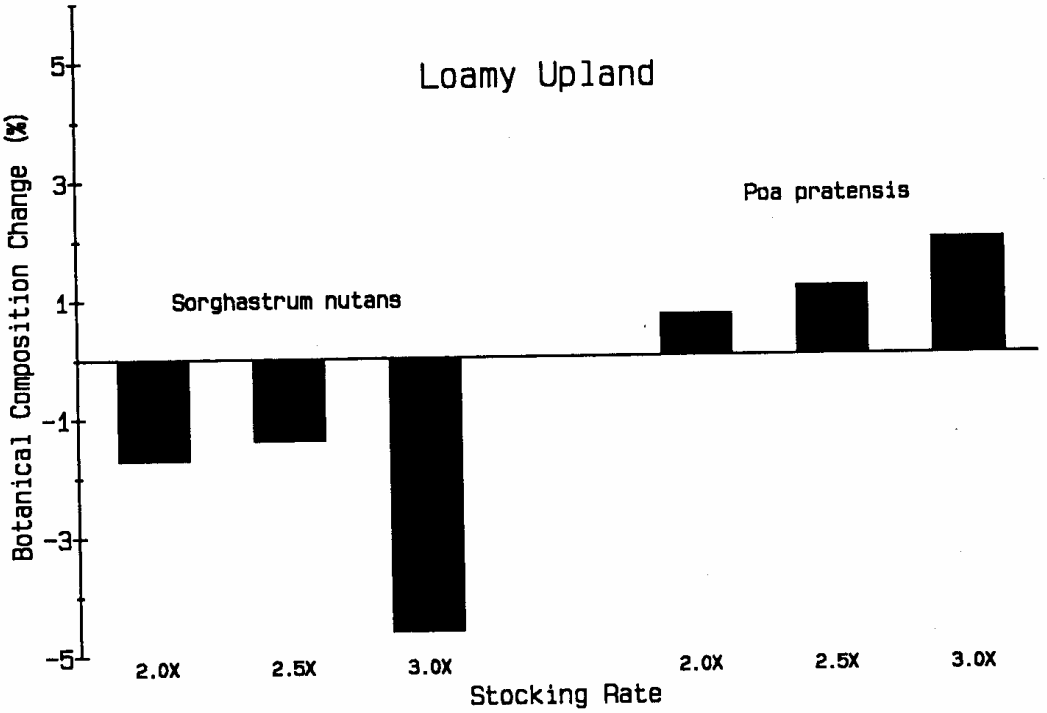

Figure 12.4. Changes in botanical composition from 1982 to 1987 under different intensives-early stocking rates for the indicated species on loamy upland range sites.

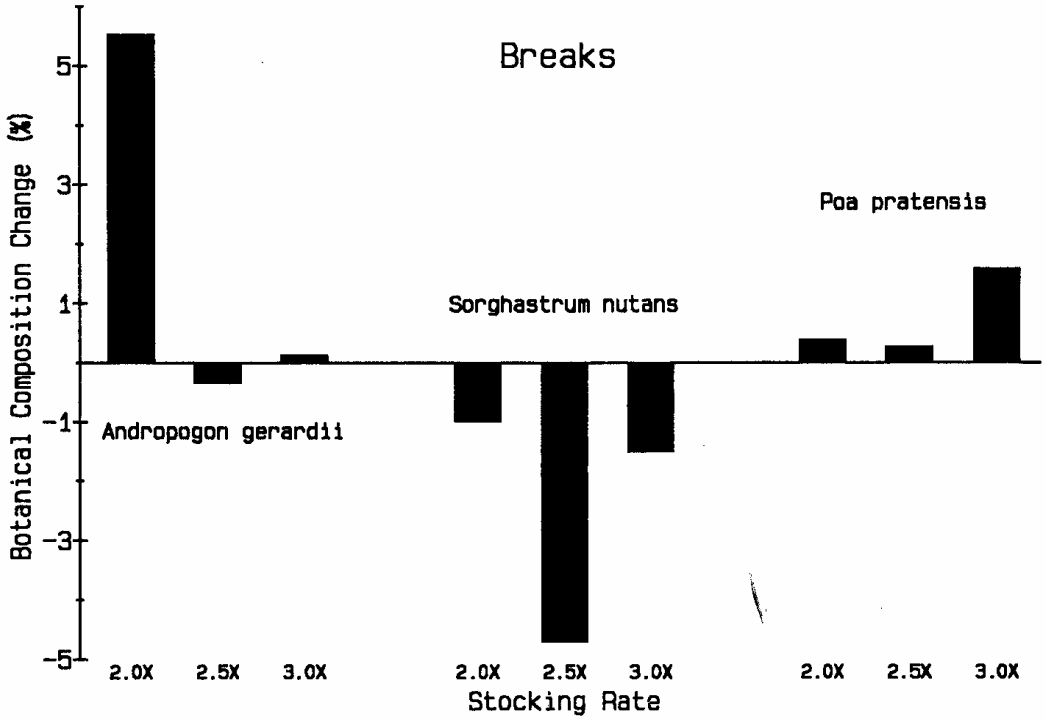

Figure 12.5. Changes in botanical composition from 1982 to 1987 under different intensives-early stocking rates for the indicated species on breaks range sites.