I. DEFOLIATION EFFECTS ON FORAGE GROWTH

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A large portion of tillers on crested wheatgrass produce unpalatable reproductive shoots in the later part of the growing season. In the early 1960s, researchers developed a method of grazing that maintained part of the crested wheatgrass forage crop in a leafy growth form called the one-crop/two-crop grazing system. When a crested wheatgrass pasture is grazed in mid-May, elongating reproductive culms are removed. This stimulates the growth of a second crop of tillers that largely remain vegetative when growth terminates in the summer. This provides a forage crop that can be used in the summer, fall, winter, or early spring higher in forage quality than a deferred pasture primarily containing reproductive stems. However, intensive management (timing and intensity of grazing are critical) and adequate soil moisture for plant regrowth are required for such a system to be successful. In other words, cattle must be on the forage crop late enough to remove young reproductive shoots but be removed early enough to allow adequate regrowth.

Renewed interest in intensive grazing systems (or methods) such as short duration grazing (SDG) or the Savory Method, and the introduction of new technology in electric fencing have raised many questions on the opportunities and effects of these systems on our forage resource. Questions frequently asked include: What percentage of years can we depend upon enough soil moisture to attain adequate regrowth? What is adequate regrowth? How late can we graze a crested wheatgrass pasture and still have good odds in attaining adequate regrowth? How much does the time vary from year to year when reproductive stems elongate enough to be removed by cattle? How much does time and duration of entry influence total forage crop production? How much does time and duration of entry influence forage quality later in the season? How much forage is being lost to senescence and death during the growing season?

The following study, initiated in April of 1983, is attempting to answer some of these questions.

Data gathered in this study were used to:

(1) construct a growth curve showing the total forage produced, standing crop present, and plant material lost to death during the growing season.

(2) determine the effect of time of defoliation on forage regrowth, forage quality, and soil moisture withdrawal.

PROCEDURES AND METHODS

Ten sets of 10, 100-foot^2 plots were laid out in a crested wheatgrass pasture in fall 1982. Beginning April 12, one set of 10, 100-foot^2 plots was clipped to ground level. At two week intervals, a different set of 10 plots was clipped until August 16. On August 16, all plots were reclipped a second time (except the August 16 plots which had not been clipped previously) to remove regrowth. During the study, soil moisture was sampled at 0 to 8 inches and 8 to 16 inches on each clipping date on plots being clipped and all plots previously clipped. Plant phenology and leaf senescence were also recorded on each clipping date.

RESULTS AND DISCUSSION

Green leaves on crested wheatgrass in April 1983 were produced in fall 1982 and overwintered (Figure 1). Rapid plant growth was initiated in mid-May and terminated in late June. Crested wheatgrass basal leaves died and became unavailable for grazing during this period.

Crested wheatgrass rarely contained more than three to four active green leaves. As leaf four began to develop, the first leaf died. In the fifth leaf stage, the second leaf was dead or dying. As leaves died, they lay prostrate on the soil surface, making them unavailable to large herbivores. By June 7, when plants were in the boot stage, the upper three leaves were green but the lower three were dead and unavailable. When the plant had reached full maturity, it consisted of a reproductive stem with two to three leaves attached; the basal leaves were dead and unavailable for large herbivore use. More than 25 percent of the total plant material produced by August 16 in the 1983 growing season was not available in the standing crop.

Defoliation before mid-May had little effect on the total forage produced (Figure 2), reproductive stems produced, and forage quality (for forage quality data, see the following paper). The first three defoliation dates occurred before elongation of reproductive stems. Of the first three defoliation dates, only the May 10 defoliation influenced soil water content. Plants defoliated on this date had their leaf areas reduced just before warming temperatures arrived and stimulated rapid growth.

Defoliating crested wheatgrass between mid-May and early June significantly influenced the total forage produced (Figure 2), forage quality, reproductive stems produced, and soil moisture withdrawal. Defoliation during this time removed elongating reproductive stems, causing the plant to produce a second crop of tillers. The reduction in total forage produced was not caused by damage to the plant but by the absence of reproductive stems. More than 90 percent of the 1,200 to 1,400 pounds per acre of forage produced in these two treatments was leaf material. Whereas forage harvested early and late in the season or near maturity was composed of only 30 and 15 percent leaf material, respectively, the remainder being stems and seedheads.

Defoliation after mid-June had no effect on total forage produced (Figure 2), reproductive stems produced, and soil moisture content. Although forage quality was enhanced by the June 20 and July 5 defoliation dates, regrowth was so low that forage intake by cattle was limited. This was a time when soil moisture levels were low and plants were nearing or at maturity. After mid-June, the forage crop was made up largely of reproductive stems with 16 to 31 percent of the total crop produced (primarily leaves) lost for grazing use.

Approximately a minimun of 150 pounds per acre of crested wheatgrass must be available for intake not to be limited. In the 1983 crop year, removing animals no later than June 17 would have provided enough regrowth to provide adequate forage. However, precipitation was above normal during the 1983 crop year. By summarizing data collected in a previous study from 1957 to 1982 we can estimate that in 7 years out of 10 we can expect 200 pounds or more per acre of regrowth to be produced if defoliation is terminated not later than late May on a healthy crested wheatgrass pasture. The occurrence of a drier year, especially in May and June, would affect both regrowth and the total forage produced. However, the compartment of produced total forage, to be most affected, would be the reproductive stems, leaf production being least affected.

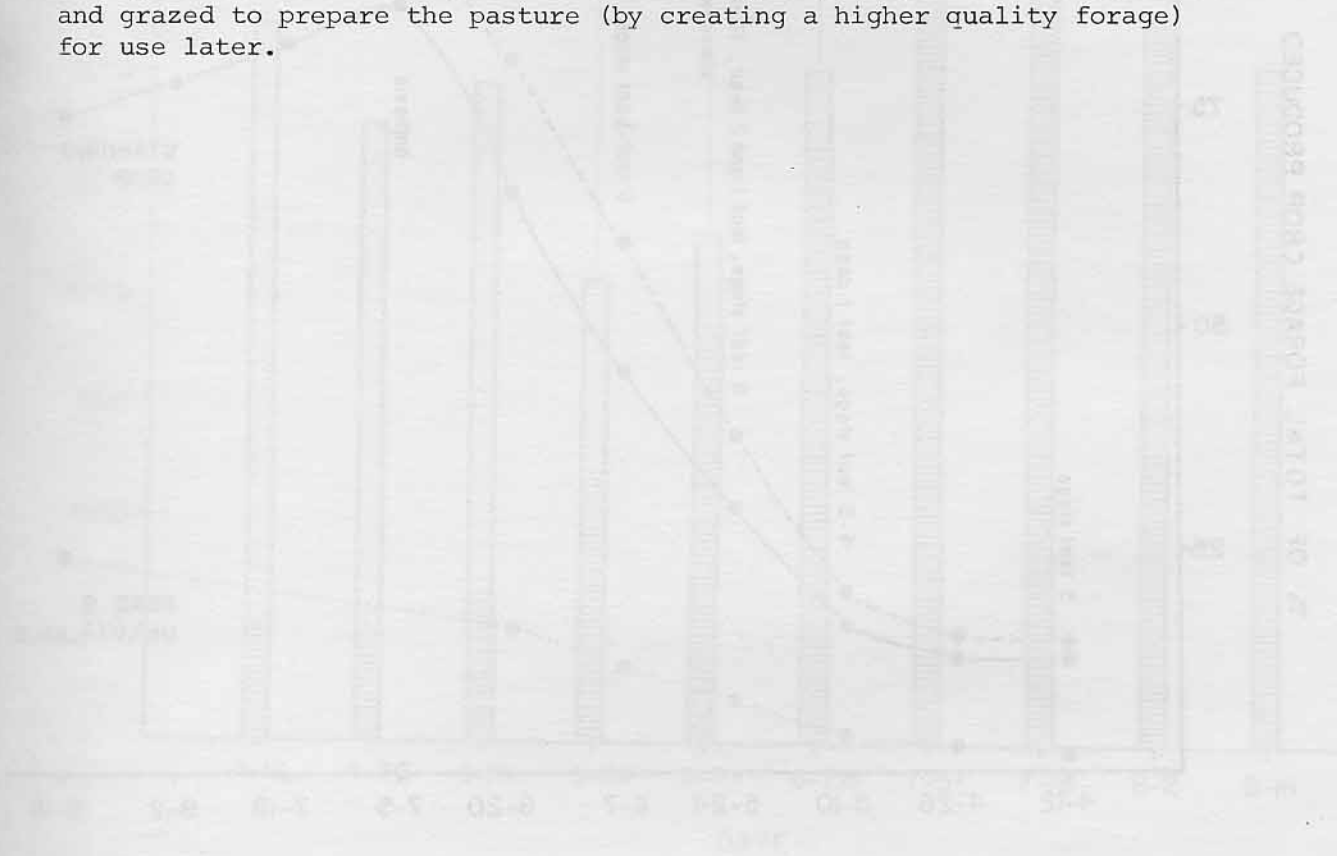
CONCLUSIONS

Early harvest of crested wheatgrass (before seedhead elongation) has little effect on the forage crop. Advantages of harvesting crested wheatgrass at this time are high quality forage, and removal of leaf material that would be lost later in the year. The harvest of high quality leaf material would be greater than pastures deferred until seed maturity. The primary disadvantage is that regrowth will be composed mainly of reproductive stems.

Harvesting plants during late May and early June maximizes the amount of leaf material both harvested and produced. Not only is regrowth comprised of leafy tillers but a maximum of leaf material that would otherwise be lost to grazing is harvested. During this period (when growth is rapid) soil moisture withdrawal is significantly reduced, thus delaying soil water depletion.

If a leaf crop of forage is desired for late summer or fall use, animals should be removed from the pasture not later than June 1. After June 1, the chances for attaining adequate regrowth quickly diminish with soil moisture. However, cattle must be present on the pasture at the proper density sometime in mid to late May to force the production of a second crop of tillers. The variability in timing of seedhead elongation will be determined by ongoing research. However, it is suspected that temperatures before mid-May and day length are involved.

The producer, through intensive grazing management, has the opportunity of harvesting a larger proportion of leaves, which are higher quality plant parts, as well as increase the production of high quality plant parts. Although it is unlikely the entire crested wheatgrass resource available to a producer can be manipulated in this way, a portion could be selected and grazed to prepare the pasture (by creating a higher quality forage) for use later.



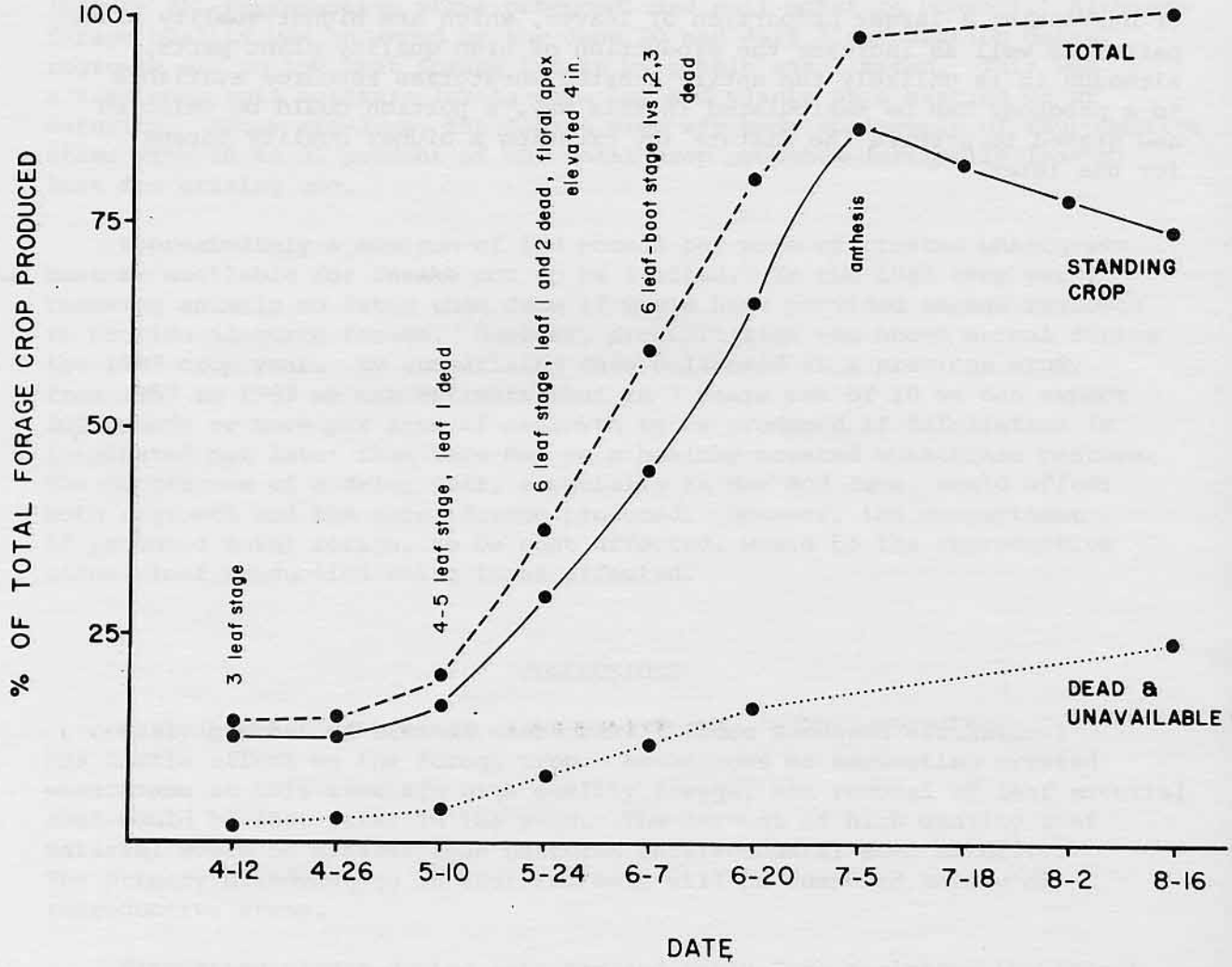


Figure 1. The percent of standing crop present at any one date from April 12 through April 16. Total represents all of the current year's biomass produced which includes standing crop plus current year's plant material that has died and is no longer in the standing crop. Dead represents primarily leaf material that has died and is no longer available in the standing crop. Both total and dead and unavailable were estimated from observation and previous clipping.

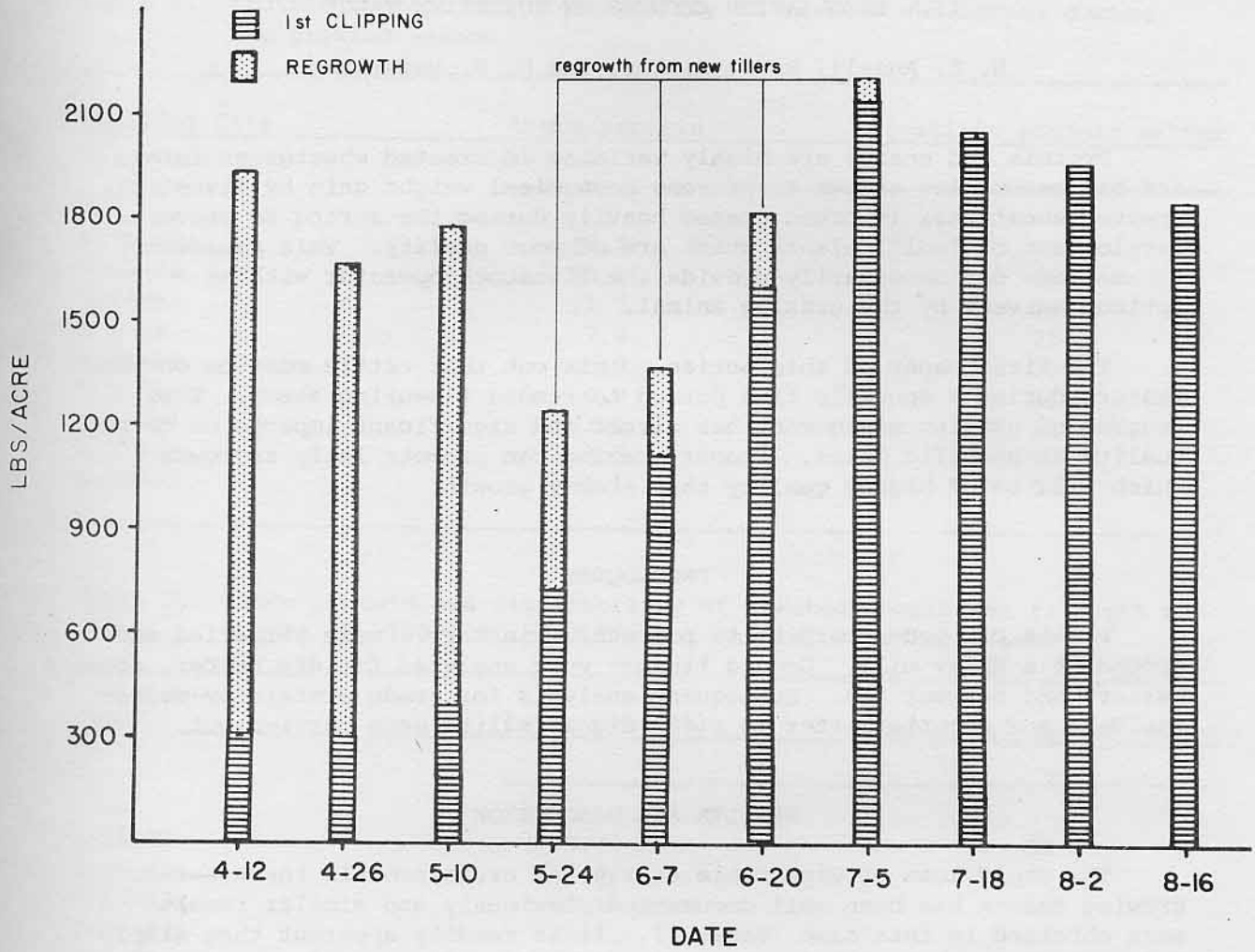


Figure 2. Total standing crop harvested for each of the 10 treatments. Total harvested = first clipping (which is indicated by date shown) + regrowth clipped on August 16.