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Yield Response of Needle-and-Thread and Threadleaf Sedge to Moisture Regime and Spring and Fall Defoliation

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Abstract

Little information is available to help managers of cool-season dominated semiarid rangelands determine when to begin and end grazing in the spring and fall. Therefore, we evaluated the effects of clipping spring and fall growth on subsequent-year yield of needle-and-thread (*Hesperostipa comata* [Trin. & Rupr.] Barkworth) and threadleaf sedge (*Carex filifolia* Nutt.) (USDA-NRCS 2012) using a randomized complete block, split-plot experimental design with fall moisture regimes (ambient or supplemental water) applied to main plots and defoliation treatments applied to subplots. Two combinations of spring defoliation, one for each fall moisture regime, were composed of a factorial array of three spring clipping dates (early May, late May, mid-June) and three levels of defoliation (0%, 40%, 80%). A third combination of treatments was composed of the supplemental water regime and an array of a single spring clipping date (late May), a single fall clipping date (late September, after regrowth), and three levels of defoliation (0%, 40%, 80%) in the same year. Ambient fall moisture was low, leading to continued senescence of needle-and-thread and threadleaf sedge, whereas the application of 10 cm of supplemental water in mid-August stimulated fall growth. The study was replicated with two sets of main plots at four sites in consecutive years, 2002 and 2003. Yield data were collected in mid-June of the year following treatment. Subsequent-year yield of needle-and-thread was not affected by defoliation under average plant-year precipitation conditions (2003) ($P > 0.05$); however, it was reduced following heavy (80%) late spring (late May or June) defoliation during a drought year (2002) ($P > 0.05$). Subsequent-year yield of threadleaf sedge was not affected by defoliation in either year ($P > 0.05$). Because it is difficult to predict when drought will occur, avoiding heavy late-spring grazing in needle-and-thread–dominated pastures in consecutive years would be prudent.

Key Words: *Carex filifolia*, drought, fall regrowth, *Hesperostipa comata*, *Stipa comata*

INTRODUCTION

Maintaining viable spring forage resources depends on spring-grazing tolerance of preferred cool-season species, the effects of precipitation regime (Olson et al. 1985; Epstein et al. 1997, 1998), and grazing management during the balance of the grazing season (Olson et al. 1985). Grazing semiarid rangeland only during the dormant season least impacts graminoid vigor and forage production (Trlica et al. 1977; Reece et al. 1996). Conversely, heavy defoliation during periods of rapid growth in spring or summer can reduce plant vigor (Pearson 1964; Reece et al. 2007a).

Native cool-season grasses and sedges comprise relatively high percentages of the herbage produced in mixed-grass prairies. Needle-and-thread (*Hesperostipa comata* [Trin. & Rupr.] Barkworth) and threadleaf sedge (*Carex filifolia* Nutt.) are among the most common and abundant cool-season species in semiarid regions of the northern and central Great Plains (Weaver and Albertson 1956; Coupland 1992). These species typically senesce as the growing season progresses, in response to increasing temperatures and/or soil moisture deficits. Needle-and-thread and threadleaf sedge may resume growth in the fall as temperatures moderate, if soil moisture levels are adequate. Traditionally, grazing managers have considered flushes of fall growth in cool-season graminoids to be a nutritional windfall for livestock production. However, initial growth in the spring or fall occurs at the expense of plant energy reserves. The effects of factorial arrays of spring and fall defoliation have not been reported for any species of *Stipa* or upland *Carex* in such semiarid ecosystems where fall growth is common. Most published clipping or grazing studies on needle-and-thread have been limited to a single date or degree of defoliation, and none have involved fall growth because little or no soil moisture was available during the fall (Peterson 1962; Pearson 1964; Wright 1967; Burleson and Hewitt 1982; Reece et al. 1988). Research on herbage yield and response to defoliation is even more limited for threadleaf sedge (Stubbendieck and Foster 1978; Fassett 2003).

Level of defoliation by season of grazing interactions could affect the ability of ranchers to sustainably use these range resources. This study was designed to explore the effects of selected spring and/or fall defoliation treatments combined

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