RANGELANDS

SINGLE AND REPEATED BURNING EFFECTS ON BLUE GRAMA RANGE

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THE STORY IN BRIEF: Research from 1990 to 2006 investigated prescribed fire for broom snakeweed (*Gutierrezia sarothrae* (Pursh) Britt. & Rusby) control on blue grama (*Bouteloua gracilis* [Kunth in H.B.K.] Lag.ex Griffiths) range on the Corona Research Ranch. Initial or first fires did not increase or decrease grass yield. However, repeat fires at <5 year intervals resulted in a 25% decline in grass yield relative to untreated rangeland. Repeat fire on blue grama range should be considered at >10 year intervals.

THE PROBLEM: Broom snakeweed, sometimes encroaches to undesirable levels on blue grama range and the shrub is controlled by prescribed fire. This is a practical alternative to herbicide spraying provided there is sufficient fine-fuel to carry the fire in a safe and effective manner.

OBJECTIVES:

12. Our objective for repeating burning events was to examine how fire might be employed through time on blue grama range without causing harmful effects to species other than broom snakeweed. .

OUTCOMES:

4. Rainfall received and other environmental parameters often dictate whether or not the use of prescribed fire is practical or even possible in a given year. During this study an insufficient quantity of fine-fuel during dry periods, and unsuitable weather conditions during planned burning periods were found to be substantial obstacles towards implementing fires at predetermined intervals. Many planned burns were rescheduled numerous times because of unsuitable environmental or plant growing conditions.
5. Early in this study it was anticipated that broom snakeweed that was removed with initial treatments would later reestablish and that follow up treatments could be evaluated. We were especially interested in examining the use of fire as a means of eliminating new invading seedlings. However, broom snakeweed never reoccupied the study areas to levels near that when the study was initiated.
6. Repeating prescribed fires at any interval on blue grama range involves risk related to weather before, during and especially after the burn (McDaniel et al. 1997). Data from our study suggest that trying to define an optimal fixed repeat burning schedule on blue grama grassland is probably futile at best.

DURATION: 1990 to current period

APPROACH: Burning treatments in 1990 and 1991 were conducted in spring (March-April) and early summer (June). Partly because of damage observed to blue grama with summer fires (McDaniel et al. 1997), further burning in 1993, 1996, 1998 and 2003 was only conducted in spring. During every burning event, fire characteristics and detailed environmental measurements, described by McDaniel et al. (1997) were monitored and

recorded using a CR-10 data logger and SM-192 storage module[1]. Before each burn five thermocouples were secured 10 cm above the soil surface on metal stakes in an arranged sequence across plots designated for treatment (Hart 1992). During burning events thermocouples relayed monitored temperature information to the SM-192 storage module for downloading to a laptop computer. Prior to burning, a bare soil fire break approximately 10m wide was graded around each plot. Wind speeds during fires varied but averaged about 5.5m/sec, and maximum wind speeds never exceeded 10m/sec. Fuel and soil moisture measurements were taken immediately before every burn. Our goal in 1993, 1996, 1998 and 2003 was to conduct burning treatments under a prescription developed, in part, from 1990 and 1991 fires (Hart 1992, McDaniel et al 1997). Prescription guidelines included: wind speed 2-8m/sec; air temperature 18-28˚C; relative humidity 10-20%; fine fuel moisture < 15%: soil moisture 3-10%; soil temperature < 18˚C. Strict adherence to this prescription was at times impractical and some experimental plots were burned outside of specified ranges.

RESULTS: Initial or first fires in 1990, 1991 and 1993 reduced broom snakeweed cover by about 80% but grass yield did not increase relative to untreated areas. Later repeat fires also did not increase grass yield. Repeat fire at <5 year intervals resulted in a 25% decline in grass yield relative to untreated rangeland when averaged over the entire study. Single and repeated burning resulted in higher average interspace area (23 cm) than herbicide treated and untreated areas (~16 cm). This gave a clumpy and less uniform grass appearance on burned areas compared to a relatively uniform cover appearance on herbicide treated and untreated areas. Of the minor grass species studied, only galleta seemed to benefit from frequent fire as its linear basal cover nearly doubled relative to untreated areas at the study's end. Conversely, blue grama linear basal cover decreased by 36% with repeated burn treatments. Winterfat (*Ceratoides lanata* [Pursh] J.T. Howell) populations were sustained after most single fires but repeated burns at < 5 year intervals reduced the shrubs abundance and cover.

POTENTIAL APPLICATION: The choice of which method (herbicide or fire) to employ for managing broom snakeweed on blue grama range should be based, in part, to the degree to which broom snakeweed occupies the area (McDaniel and Ross 2002). Herbicide treatment is better suited than burning when broom snakeweed is densely populated because a continuous fine-fuel source is usually lacking and precludes the fire option. Burning is a viable option only when there is a sufficient continuous fuel source to carry the fire. However, unlike herbicide treatments we noted no beneficial increase in grass yield from fire compared to untreated rangeland. On blue grama range in central New Mexico, fire should probably be viewed as a control alternative for removing broom snakeweed but not as management practice for increasing forage production.
area.

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