Effects of Prickly Pear Control (Prescribed Fire x Herbicide) on Three Important Food Plants of Northern Bobwhite: An Observation

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ABSTRACT

Millions of acres of Texas rangelands have been infested by prickly pear cactus (*Opuntia* spp.). Because prickly pear is perceived as a nuisance plant to livestock producers, many landowners control prickly pear through a tandem of prescribed fire and an aerial application of picloram (4-amino-3,5,6-trichloropicolinic acid). While the effectiveness of such a practice has been documented, its effects on important wildlife food plants has received little attention. The objective was to compare density of 3 important food plants for northern bobwhite (*Colinus virgnianus*) between a burned-only and burned-and-sprayed area. A 1,198-ac pasture was burned in February 1998, and subsequently sprayed with picloram a 400-ac portion in April. Density for ragweed (*Ambrosia psilostachya*), croton (*Croton* sp.), and snow-on-the-mountain (*Euphorbia marginata*) was determined by randomly sampling 40 circular plots (20 in. radius) in both treatment areas during July 1998. Ragweed had a higher mean density in the burned-only area (19.8 plants/yd^2) compared to the burned-sprayed (1.3 plants/yd^2; $P = 0.0001$). Croton also had a higher mean density in the burned-only area (1.6 plants/yd^2) than in the burned-sprayed (0.2 plants/yd^2; $P = 0.02$). There was no difference in snow-on-the-mountain mean density between burn-only (0.3 plants/yd^2) and burned-sprayed (0.3 plants/yd^2; $P = 0.5$). Because forbs represent important food plants for wildlife, further research is needed to document the immediate and long-term impacts of picloram-treated sites.

KEYWORDS: Bobwhite, brush control, cactus, forb, northern bobwhite, picloram, prescribed fire, prickly pear

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Prickly pear cactus (*Opuntia* spp.; hereafter prickly pear) has invaded approximately 25 million acres of Texas rangelands (Lundgren et al. 1981). Prickly pear is perceived as a serious range management problem (Lundgren et al. 1981), especially in the Rolling Plains ecoregion of Texas (Scifres 1980:1-40). Dense stands of prickly pear interfere with forage utilization and livestock movement and handling (Ueckert 1997). Ingestion of prickly pear fruit also may cause ulceration and bacterial infection in the lips, tongue, palate, and gastrointestinal tracts of livestock, while the seeds may cause rumen impaction (Merrill et al. 1980). Therefore, many landowners advocate the control of prickly pear.

Prickly pear control often is achieved through prescribed fire and a subsequent aerial spraying of the herbicide picloram (4-amino-3,5,6-trichloropicolinic acid). This tandem of prescribed fire and picloram spraying is very effective in controlling prickly pear, achieving 98% mortality of prickly pear (Ueckert et al. 1988). While the effectiveness of prickly pear control has been documented, its effect on important wildlife food plants has received little or no attention.

In conjunction with prickly pear mortality, picloram is considered highly effective for control of broad-leaf herbaceous plants (i.e., forbs) on rangeland (Scifres 1980:165-170), resulting in a phenomenon referred to as "forb shock". The duration of forb shock is unknown for picloram; however, for other herbicides it can last at least 1 growing season after application (Scifres and Mutz 1978). Forbs represent important food plants for several wildlife species, such as northern bobwhite (*Colinus virginianus*; Lehmann, 1984:165–176), wild turkeys (*Meleagris gallopavo*; Hurst 1992), mourning doves (*Zenaida macroura*; Lewis 1993), and white-tailed deer (*Odocoileus virginianus*; Verme and Ullrey 1984). Thus, the reduction in forb abundance following prickly pear control might be detrimental to wildlife populations, depending on several factors such as the amount of area treated and degree of forb reduction.

The objective was to document immediate impacts (0-3 months post treatment) of prickly pear control on abundance of 3 important food plants for northern bobwhites (hereafter, bobwhites). Bobwhites were chosen as the case-study species because of their economic importance as a game bird.

MATERIALS AND METHODS

Study Area

This study was conducted on a private ranch located in Shackelford County, Texas, which lies at the junction of 2 ecoregions (Hernández 1999). The majority of the county (>75%) is found within the Rolling Plains ecoregion, while the far eastern portion of the county is contained within the Cross Timbers and Prairies ecoregion (Gould 1975). Mean annual rainfall in the Rolling Plains ranges from 22 to 30 in. (Correll and Johnston 1979). Soils vary from coarse sands to redbed clays and shales (Gould 1975). The general aspect of the landscape is a honey mesquite (*Prosopis glandulosa*) savannah. However, honey mesquite has increased its density over much of the region in the last 50 years, with prickly pear as a codominant over many areas (Scifres 1980:1-40).

Data Collection and Analysis

A 1,198-ac pasture was burned in February 1998 under prescriptions according to Natural Resource Conservation Service guidelines. The area was prescribed burned during morning hours (8-10 AM) using a headfire, which was conducted in 65º F, 35% humidity, and 10 mph wind speeds. In April 1998, a 400-ac portion was aerially sprayed

with picloram at a rate of 0.25 lb/ac. In July 1998, 40 circular plots (20 in. radius) were randomly sampled in the burned-only and burned-sprayed areas. A non-treated area (i.e. control) was not sampled because in heavily-infested areas, prickly pear control is warranted in order to improve rangeland condition or manage wildlife habitat. Under this context, land stewards have to decide between the more effective method of controlling prickly pear (i.e., prescribed fire x picloram) or the more traditional method (i.e., prescribed burning only). Because the impacts realized on wildlife habitat by each method is an important consideration in this decision process, the intent was to document how each method impacted wildlife habitat, namely density of 3 important bobwhite food plants. Thus, no untreated area was sampled and the burned-only area represents the statistical control.

Forty random plots were selected in each area from a 55 yd. x 55 yd. grid overlain on a map of the study site. At each plot, the number of individual plants were counted for 3 forb species: western ragweed (*Ambrosia psilostachya*), croton (*Croton* sp.), and snow-on-the-mountain (*Euphorbia marginata*). These 3 species were selected because they represent important and common food plants for bobwhites in this ecoregion (Jackson 1972).

Density of the selected fobs was analyzed between treatments using Wilcoxon rank sums test (Daniel 1987) the data were not normally distributed. All results are reported as $\bar{x} \pm$ S.E. and consider results significant at $\alpha = 0.05$.

RESULTS

Ragweed was more dense in the burned-only area (19.8 ± 3.2 plants/yd^2) compared to the burned-sprayed area (1.3 ± 0.8 plants/yd^2 ; $P = 0.0001$). Croton also had a higher density in the burned-only (1.6 ± 0.5 plants/yd^2) than in the burned-sprayed (0.2 ± 0.1 plants/yd^2; $P = 0.02$). Lastly, there was no difference in snow-on-the-mountain density between burned-only (0.3 ± 0.1 plants/yd^2) and burned-sprayed (0.3 ± 0.1 plants/yd^2; $P = 0.5$).

DISCUSSION

Chemical control of prickly pear through the tandem treatments of prescribed fire and aerial spraying of picloram reduced forb density for 2 of 3 species. A significant difference in density was observed between treatments in ragweed and croton, but not snow-on-the-mountain. Results correspond with other research (McCarty and Scifres 1972), which indicates that picloram can effectively control ragweed. However, the response of individual forb species vary considerably to herbicides, which might explain why only 2 forb species were affected in this study. Blaisdell and Mueggler (1956) reported that only 13 of 38 forb species were moderately (34-66% kill rate) to severely (67-100% kill rate) damaged on a sagebrush (*Artemesia* spp.) community treated with 2,4-D . This varying susceptibility of plants to herbicides can be explained by stage of plant development at the time of treatment (Brady 1971).

Herbicides generally penetrate younger leaves more rapidly than older foliage (Scifres 1980) and are more effective during rapid vegetative growth and maximum emergence (McCarty and Scifres 1972). As plants age, species formerly killed by herbicides may be only slightly affected later (Scifres 1980). Because the forb species monitored in this study may have been at different development stages, the effect that picloram had on forb density possibly varied in this study.

A more critical question to consider is what impact the reduction in forb density actually has on wildlife populations. The answer to this question is a function of the effectiveness of the treatment in reducing forb density (i.e, which forb species are affected and the degree and duration of forb shock) and the scale of the treatment. Naturally, this relationship will vary by wildlife species. The focus is on bobwhites for the purpose of this discussion.

Food availability (as measured in kilograms of seed produced per hectare) generally is not considered limiting for bobwhites (Guthery 1997). However, forb shock resulting from prickly pear control may reduce temporarily (i.e., 0-2 years) food availability. Ragweed and croton densities were documented as being lower in the burned-sprayed area compared to the burned-only area. Ragweed and croton are important seed-producing plants for bobwhite in the Rolling Plains of Texas (Jackson 1972). Furthermore, density and structure of herbaceous plants influences the abundance of phytophagus insects (Lawton 1983). Insects represent an important food item for bobwhite chicks and breeding adults (Stoddard 1931:159-164, Rosene 1969:108). Therefore, reduction of forb density and potentially insect abundance following prickly pear control might be detrimental to bobwhites.

It is recommended that landowners consider an approach of prickly pear management instead of prickly pear eradication. Perhaps, landowners should manage prickly pear with prescribed fire and picloram only in areas of heavy infestations (i.e., solid, expanse stands of prickly pear). Periodic (every 5-7 years) prescribed fire by itself might be used to manage prickly pear in areas of lower infestation (Ueckert 1997). This management approach would allow landowners to manage cactus density while maintaining adequate bobwhite habitat at the landscape scale.

The impacts of prickly pear control (prescribed fire x picloram) on wildlife populations need to be investigated in greater detail. Specifically, research is needed to document the impacts of prickly pear control on seed production and insect abundance, as well as on the duration of forb shock on treated sites.

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