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Managing Vegetation in Grasslands Habitats to Meet Livestock or Wildlife Objectives

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Presenter Information

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Managing vegetation in grasslands habitats to meet livestock or wildlife objectives

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Abstract

Sustainably stewarding grassland systems involves applying various practices to manipulate forage interactions with other plants, the environment, and grazing animals to meet resource manager objectives. These interactions can result in invasion or encroachment and increased abundance of weeds which hinder attainment of management objectives. Weeds influence the structure and function of pasture ecosystems whether forages are grown in improved pastures, rangeland, or grassland communities. They degrade pasture quality and reduce livestock performance by interfering with forage establishment, yield, and quality by competing for resources. Weeds reduce the feed value of forage, decrease pasture carrying capacity, and can be toxic or unpalatable to livestock. Managing weeds requires use of vegetation management tools that favor desirable forages. Herbicides can be catalysts that expedite grassland renovation, improve the forage resource, and increase carrying capacity. Corteva Agriscience has a variety of herbicide products that provide superior control of herbaceous and woody weeds, while maintaining the desirable vegetation. These herbicides were designed and developed specifically for selective broadleaf weed control in rangeland, pastures, rights-of-way, non-cropland, and natural areas. Active ingredients historically used include aminopyralid, triclopyr, fluroxypyr, clopyralid, and picloram. Rinskor™ active and Arylex™ active are new herbicide active ingredients from Corteva Agriscience™ and are members of a unique synthetic auxin chemotype, the arylpicolinates (HRAC group O / WSSA group 4). Members of the arylpicolinate family demonstrate novel and differentiated characteristics in terms of use rate, spectrum, weed symptoms, environmental fate, and molecular interaction as compared to other auxin chemotypes. When applied as a stand-alone treatment or in various mixes these products are safe to desirable grass species and control key herbaceous and woody weeds in the genera *Ambrosia*, *Acacia*, *Carduus*, *Centaurea*, *Cirsium, Mimosa*, *Prosopis*, *Ranunculus*, *Rumex*, *Sida, Solanum, Taraxacum,* and more.

Introduction

Grasslands are the foundation upon which livestock performance, ranch profitability, livestock farmer sustainability and subsistence are built. Without a healthy, well-managed grassland resource the genetic potential of livestock will not be realized. Grassland systems involve applying various practices to manipulate forage interactions with other plants, the environment, and grazing animals to meet resource manager objectives (Masters et al., 1996). These interactions can result in invasion and increased abundance of weeds, which hinder attainment of management objectives. A weed is a plant that is growing in the wrong/undesired place? Weeds can be toxic or unpalatable to grazing animals, can compete with desirable plants for light, space, water and nutrients, can be aesthetically unpleasing, or declared as noxious by government authorities and must be controlled (Barnhart et al. 2005). Weeds influence the structure and function of grassland ecosystems whether they are improved pastures, rangeland, or other grassland communities. Weeds interfere with the establishment, yield, and quality of grasslands by competing for resources such as light, space, nutrients, or water and/or by producing and releasing allelochemicals (Smith, 1991) that inhibit growth and development. Weeds often reduce the feed value of forages and can be toxic or unpalatable to livestock (Marten et al., 1987). Weeds can also reduce the feed value of grasslands, decrease animal carrying capacity, and can be toxic or unpalatable to livestock. Vegetation manipulation is the only practical way to increase forage for livestock and to improve wildlife habitat on some grasslands (Holechek et al., 2004) especially when land prices prohibit the acquisition of more acreage. It is therefore important that grassland managers know what constitutes the desired plant community (DPC) based on their management objectives for the land.

The concept of DPC is consistent with prevailing state and transition and steady state models of vegetation change (Westoby et al., 1989) and can empower land managers to design a plant community to meet management objectives, consider trade-offs such as benefiting grassland wildlife at the expense of woodland species and allows them to take a broader "systems" perspective that balances needs of wildlife in conjunction with other ecosystem services affected by woody plant encroachment and brush management (Fulbright et al. 2018).

Prevention, control and eradication are basic weed management strategies. In practice, prevention and eradication can be difficult to attain and managing or controlling the weed or brush invasion is often a more prudent and achievable outcome. Using any single technology to control weeds results in a slow rate of grassland recovery while integrated use of complimentary and possibly synergistic vegetation management technologies accelerates progress toward higher quality rangeland (Masters and Nissen 1988). Removing weed species with a single, specific control measure may only open niches for other undesirable species to occupy or to be reinvaded by the same species unless desirable species are present to fill the vacated niches (Masters and Sheley 2001). Where desirable species are either not present or in low abundance, plant community recovery will be slow or will not occur without revegetation (Masters et al., 1996).

Weeds can also affect grazing distribution as reported by Sather et al. (2013) who found that three months after herbicide application, cattle distribution was 1.3 to 5 times greater in herbicide treated compared to nontreated portions of pastures. In addition to improving the grazing distribution, herbicide use can significantly improve grassland forage productivity by as much as 2.8 to 7.5 times the non-treated grassland (Sheley et al. 2000). Herbicides can be catalysts that expedite grassland renovation, improve the forage resource and grazing distribution, and increase carrying capacity. Corteva Agriscience has a variety of herbicide products that provide superior control of herbaceous and woody weeds. These herbicides were designed and developed specifically for selective broadleaf weed control in rangeland, pastures, rights-of-way, non-cropland, and natural areas. Active ingredients historically used include aminopyralid, triclopyr, fluroxypyr, clopyralid, and picloram. Rinskor™ active and Arylex™ active are new herbicide active ingredients from Corteva Agriscience™ and are members of a unique synthetic auxin chemotype, the arylpicolinates (HRAC group O / WSSA group 4) and have also being successfully introduced for use in grasslands. Members of the arylpicolinate family demonstrate novel and differentiated characteristics in terms of use rate, spectrum, weed symptoms, environmental fate, and molecular interaction as compared to other auxin chemotypes (Epps, et al., 2016, McCauley and Young, 2019). When applied as a stand-alone treatment at recommended rates or in various mixes these products are safe to desirable grass species and control key herbaceous and woody weeds in the genera *Ambrosia*, *Acacia*, *Carduus*, *Centaurea*, *Cirsium, Mimosa*, *Prosopis*, *Ranunculus*, *Rumex*, *Sida, Solanum, Taraxacum,* and more.

Methods and Study Site

Trials were established in multiple years and using multiple application methods such as aerial, ground broadcast, and foliar individual plant treatment (spot treatment),. All treatments were prepared and applied at the timing based on label recommendations and application volume ranged from 50 liters per hectare (L ha^{-1}) for aerial broadcast to 400 L ha^{-1} for ground broadcast. Trials were established in Randomized Complete Block Design with a minimum of 3 replications. In some instances, data represent trials repeated multiple years and sometimes the data represents multiple trials within a year. All treatments were applied at the recommended growth stage for the target species that would provide optimum control. Visual estimate of percent control was taken on a scale of 0 to 100% where 0% is no effect and 100% represents complete mortality of the target species. The interval from treatment application to each evaluation varied based on weed type (annual, perennials, woody or brush) and for many species will have an evaluation at 1 and 2 years after treatment (YAT).

Results

Mesquite (*Prosopis spp.*) is a problem species in grasslands across multiple regions of the globe including North America, South America, Africa, and Australia and can be difficult to control regardless of the method used. In trials established in Texas, USA, 2009 to 2011 the newly developed Sendero® herbicide (aminopyralid 60 g ae + clopyralid 276 g ae L^{-1}) applied at 2 L ha^{-1} provided 76±11% control of mesquite two years after treatment (YAT) compared to 64±18% control for what was then the industry standard treatment of triclopyr + clopyralid at 280+280 g ae ha^{-1}. In Argentina (2YAT) and Paraguay (1YAT), *P. ruscifolia* was effectively controlled by Sendero by individual plant treatments (spot treatment) and broadcast applications at 2 and 4 L ha^{-1}, respectively compared to aminopyralid + fluroxypyr (40 + 80 g ae L^{-1}) at 3 and 6 L ha^{-1}. These trials and others conducted since, then confirmed that Sendero® provided increased efficacy, but also more consistency of control compared to triclopyr + clopyralid, aminopyralid + fluroxypyr, and other products that were previously being used. *Acacia spp.,* broadly distributed in a geographical area similar to mesquite and is often cohabiting an area, is effectively controlled by Sendero as spot treatment, ground or aerial broadcast. In Paraguay, Sendero provided 93 and 100% control of *A. caven* at 275 days after treatment with 3 and 4 L ha^{-1}, respectively. Picloram + fluroxypyr at 240 + 240 g ae ha^{-1} provided 75% control.

Many desirable species are often intermixed as secondary species to mesquite and regardless of the management practice used, care must be taken to reduce the impact on these desirable species. Ansley et al. (2020) evaluated the tolerance level of secondary brush species over many years to herbicide treatments targeting mesquite and mixed brush in Texas, USA, beginning in 2013. Sites were evaluated at 3 months, 1 year and 2 years after initial treatment, which was usually from June to July. At 1 and 2YAT, evaluations were made of percent canopy reduction and percent mortality and categorized into one of 4 categories – Tolerant, Moderately Tolerant, Moderately Susceptible, and Susceptible. For Sendero, 27 of 30 species evaluated were characterized as tolerant while key target species, mesquite and honey locust (*Gleditsia triacanthos*) were characterized as susceptible.

Canada thistle (*Cirsium arvense* L.) is a long-lived perennial with deep roots and rhizomes that make it difficult to control and allows it to propagate sexually and asexually. Aminopyralid is very effective at controlling Canada thistle with much lower use rates than other commonly used herbicides such as picloram, clopyralid, and 2,4-D which typically utilize much higher rates of active ingredient per unit area. At 2YAT, trials conducted across 5 sites in the United States (North Dakota (2), Nebraska, Virginia, and Washington state) showed that control provided by aminopyralid at 105 g ae ha^{-1} was 92% compared to picloram at 420 g (89%), clopyralid at 420g (73%), and dicamba at 560 g (47%).

When aminopyralid is combined with florpyauxifen-benzyl (Rinskor® active) or halauxifen-methyl (Arylex® active), two new active ingredients in the arylpicolinate family that demonstrate novel and differentiated characteristics, the total amount of active ingredient per unit area is reduced and a wider spectrum of weeds can be controlled. Aminopyralid + halauxifen-methyl (75 + 4.5 g ae ha^{-1}) provided significantly better control of *Sida rhombifolia* and *Sida acuta* when averaged across trials in Colombia, Costa Rica, and Mexico in 2018 and 2019, compared to picloram + 2, 4-D (256 + 960 g ae ha^{-1}) and aminopyralid + 2,4-D (160 + 1280 ae ha^{-1}). Similarly, aminopyralid + florpyrauxifen-benzyl (70 + 7 g ae ha^{-1}) provided better control of multiple annual and perennial weeds in United States pastures compared to aminopyralid + 2,4-D (86 + 700 g ae ha^{-1}).

Discussion [Conclusions/Implications]

Tracy and Sanderson (2004) reported a 'consistent negative relationships between forage species diversity and weed abundance', therefore, maintaining a diverse community of desirable species is a recommended management practice. Technologies are available for managing weeds and brush in grasslands but to be successful in the long term, an integrated weed management program should be incorporated into grassland management plans (DiTomaso et al. 2010). While these technologies are readily available for use, it will be important to also focus on pasture and grazing management overall. Huwer et al. (2002) found that while pasture management alone had no effect on weed biomass, the use of pasture management with herbicide strategies led to overall effective long-term weed control. When brush canopy cover from mesquite is low it is not considered a problem for grass production. Lyons and Rector (2020) reported that when canopy cover nears 20 percent, mesquite competes with grass for water and nutrients. Reducing competition from mesquite by killing or suppressing the plants has been shown to increase grazing capacity by 7 to 16% over a 4-year period on light and heavy infested pastures, respectively (McDaniel et al. 1975).

Many managers are now managing grasslands for livestock production as well as wildlife and sometimes wildlife the more important economic factor, so vegetation management is focused on that. Ansley et al. (2020) explores integrating herbicides in wildlife habitat management but also provides information on the tolerance of a wide range of shrubs to applications of certain herbicides targeted at controlling Prosopis spp. Many managers will take action to control Prosopis but want to reduce the impact on desirable shrubs in the habitat. In some instances, strips of brush or weeds will be left intact in grasslands to provide cover, browse or feed for a variety of wildlife.

Weeds degrade grassland quality and reduce livestock performance by interfering with forage establishment, yield, and quality by competing for resources. They reduce the feed value of forage, decrease pasture carrying capacity, and can be toxic or unpalatable to livestock and wildlife. Left unchecked, weeds can significantly reduce the habitat quality for wildlife and reduce ecosystem services. Herbicides can be a catalyst that expedite grassland renovation, improve the forage resource, and increase carrying capacity or rehabilitate habits for wildlife. Findings from our research show that herbicides offer selectivity to desirable grasses and many other desirable species while simultaneously being more effective at controlling troublesome weeds or brush in grasslands around the globe.

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