Conservation Seeding and Diverse Seed Species Performance

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Introduction

The rehabilitation of degraded big sagebrush (*Artemisia tridentata*) communities infested with cheatgrass (*Bromus tectorum*) and other competitive weeds is a daunting task facing resource managers and land owners. Rehabilitation is critical for the numerous demands on these rangelands such as forage for wildlife and livestock. Decision making in this process has long relied on Plant Material Research.

"Stopping the wildfire cycle, soil erosion and invasion of cheatgrass is a choice. Similarly, cheatgrass invasion, repeated burning and loss of topsoil is also a choice"

Jerry Chatterton retired Plant Physiologist, Research Leader, Forage and Range Research Laboratory, USDA-ARS, Logan, Utah.

The USDA-ARS-Great Basin Rangelands Research Unit in cooperation with private land owners, State and Federal agencies tested weed control practices, seeding methodologies and plant material testing of desirable species to improve degraded habitats in northern Nevada.

Figure 1. Degraded Wyoming Big sagebrush community at the Horse Creek Ranch located in the King's River Valley of northern Nevada prior to rehabilitation efforts.

Methods

The research site is located in northern Nevada, 70 km west of Orovada, Nevada at the Horse Creek Ranch. The site is near agronomic fields limiting herbicide use, therefor mechanical weed control was conducted by disking in the spring (**Figure** 2). The site was seeded in the fall (October 2010) (**Figure 3**). In one test plot 26 species were seeded individually and then 3 seed mixes tested at a second plot (Table 1). Plant material testing plots were 2m x 30m while seed mix plots were 15m x 60m. Six randomly selected 1m² quadrats were selected for each plot and then fixed over-time to measure emergence, mortality and establishment in each given quadrat. Quadrats were read monthly from April through September. Plants counted in September 2012 reflect established plants for the given treatments.

Native
Introduced

	lbs/acre
Shadscale	**4**
Gardner's Saltbush	4
Lewis Flax	1
Munroe Globemallow	1
Desert Globemallow	1
Penstemon	1
Sweetvetch	1
Needle-and-Threadgrass	7
Sandberg Bluegrass	2
'High Plains' Bluegrass	2
'Whitmar' Beardless Wheatgrass	7
'Secar' Bluebunch Wheatgrass	7
Bottlebrush Squirreltail	7
'Sherman' Big Bluegrass	2
Small burnet	
Western Yarrow	0.5
Wyoming big sagebrush	
Four-wing Saltbush	4
Thickspike Wheatgrass	7
'Hycrest' Crested Wheatgrass	7
'Immigrant' Forage Kochia	2
'Bozoisky I' Russian Wildrye	7
'Bozoisky II' Russian Wildrye	7
'Standard' Crested Wheatgrass	7
Siberian Wheatgrass	7
'Ephraims' Crested Wheatgrass	7
'Nordan' Crested Wheatgrass	7
'Snowstorm' Forage Kochia	2

Native mix
Combo mix
Introduced mix

Results and Discussion

Initial Emergence

Native shrubs and forbs were largely unsuccessful exhibiting very low emergence, 0-35.5/m². 'Secar' bluebunch wheatgrass, 45.2/m² and Bottlebrush squirreltail, 38.8/m², recorded the highest emergence for native grasses. Species that experienced the best initial seedling emergence were the introduced perennial grasses Siberian wheatgrass (*Agropyron fragile* ssp. *sibericum*), 104.4/m² and 'Ephraims' crested wheatgrass (*Agropyron cristatum*), 93.6/m².

By September 2012 establishment was greatly reduced from the initial emergence numbers. Introduced perennial grasses, 'Ephraims' crested wheatgrass, 0.90/m², and Siberian wheatgrass 6.3/m² and the introduced shrub 'Immigrant' forage kochia (*Bassia prostrata*), 4.3/m² performed the best, however did not meet our goal of 10/m².

Figure 2. Spring disking significantly decreased cheatgrass seed production and active seed bank as well as prepping the seedbed for seeded species.

Precipitation

The site received 26.6 cm (10.5") of precipitation during the 2010/2011 season (October 1 thru September 30), but only 10.6 cm (4.2") in 2011/2012 which contributed to poor seedling establishment. The "native" shrubs and firbs seed mix was largely a complete failure as no native shrubs or forbs were recorded.

Seed mixes

The native seed mix performed poorly. Native grasses peaked at 7.5/m² and established at 0.7/m² with *No* shrubs or forbs establishing.

The introduced mix peaked at 18.3 perennial grasses/m², 8.6 forage kochia/m² with an establishment of 4.3 perennial grasses/m² and 3.2 forage kochia/m² (**Figure 4**).

The native and introduced (combo) mix resulted in a perennial grass peak of 25/m² and established at 5.4/m², which was largely made up of 'Hycrest' crested wheatgrass.

Figure 3. October 2011. The use of a half-sized rangeland drill to seed desirable seed species following active weed control practices.

Conclusion

Properly selecting those seed species and seed mixes with the inherent potential to germinate, emerge and establish in arid environments can improve rangeland rehabilitation efforts and decrease cheatgrass densities and associated fuel loads. Seeding species for the selection of diversity that results in a failure only exacerbates the frustration of failed restoration/rehabilitation efforts and results in further degradation of rangelands.

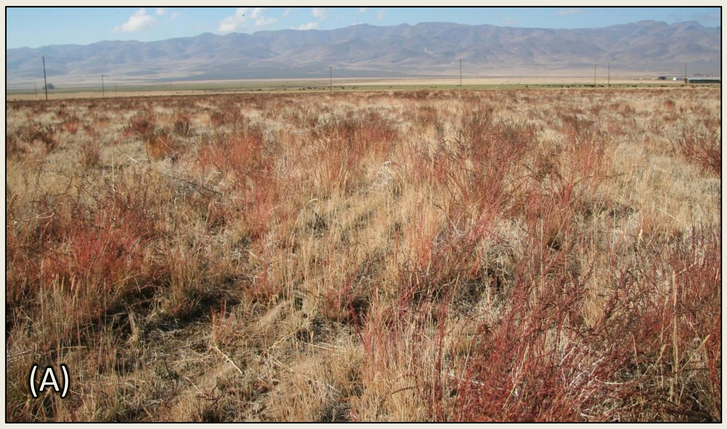

Figure 4. Excellent density of forage kochia (A) and long-lived perennial grasses (B). Established perennial grasses provide the competitive ability to suppress cheatgrass significantly reducing fuels (C). Forage kochia further provides green material to decrease fire threats.

Suggested Reading:
Chatterton, J. 2008. *In:* Great Basin Wildfire Forum: The Search for Solutions. eds. E. Miller and R. Narayanan. Nevada Agric. Exper. Sta. University Nevada, Reno 2008.