Evaluating Strategies for Increasing Plant Diversity in Crested Wheatgrass Seedings [Elko County, NV]

> Kent McAdoo, UNCE John Swanson, UNR Nancy Shaw, USFS

"Assisted Succession"

(Cox and Anderson)

Restoration of weed-threatened areas may require rehabilitation, then diversification



Challenge/Opportunity: Enhancing Diversity for Wildlife

Crested Wheatgrass Seedings With 10% Successional Sage Cover (18 - 28 yr after shrub control & seeding)

48% Sage Obligate Birds 52% Grass-nesting Birds (McAdoo et al. 1989 J. Wildlife Manage.)

Research Objectives

1 - Determine the effect of crested wheatgrass (Aropyron desertorum) control methods on wheatgrass density and cover.

2 - Determine the effect of crested wheatgrass control methods and revegetation on establishment of seeded species.

Great Basin Native Plant Selection & Increase Project

- **Companion studies in:**
- Utah
 Oregon
 Idaho
 Nevada

Crested Wheatgrass Control and Revegetation Treatments

Disking

- Spring-applied glyphosate
- Disking + spring-applied glyphosate
 Spring- + fall-applied glyphosate
 Control (no treatment)

The study site is comprised of five 5-acre blocks, using a randomized block, splitsplit plot design. Each 1-acre treatment plot was divided into seeded and unseeded sub-plots.

Treatment Chronology

- During November 2007, "disked only plots" were 3-way disked.
- In May, 2008 "spring-applied herbicide plots" and "combined disked and herbicide plots" were sprayed with 64 oz. glyphosate/ac.
- In early October 2008, "combined springand fall-applied herbicide plots" were sprayed with 64 oz. glyphosate/ac.
- In late October 2008, sub-plots were seeded by personnel from the NRCS Aberdeen Plant Materials Center with a Truax Rough Rider rangeland drill.

Final seeding mix* for South Fork study plots, Elko County, NV, in sandy loam soil (Orovada Puett association), approximately 8" precipitation zone.

<u>Species</u>	PLS lb/ac
Indian ricegrass	2.0
Bottlebrush squirreltail	2.0
Needle-and-thread grass	2.0
Basin wildrye	2.0
Bluebunch wheatgrass	1.0
Sandberg bluegrass	0.75
Munro globemallow	0.5
• Lewis flax	0.75
Western yarrow	0.2
Wyoming big sagebrush	0.2
Spiny hopsage	0.5
Total	11.9

*Based on ecological site description





Data Collection – 2009 & 2010

- For crested wheatgrass, we estimated herbaceous cover, density, and seedling frequency in ten 0.25 m² quadrats placed randomly on each of 5 transects and perpendicular to each belt transect
- Density for seeded native species was measured within these same quadrats



Preliminary Results



Spray 2X (spring & fall)

2 Treatments That Reduced Agde (P<0.05)

Spray

Disk + Spray

Significant Agde Reduction (p<0.05)

Crested Wheatgrass Cover (2009)*



Crested Wheatgrass Density (2009)*



Crested Wheatgrass Density (2010)*



Density of Seeded Native Grasses (2010)*



Seeded Forb Densities (2010)*



Density of All Seeded Species (2010)*



Seeded Species Establishment



























Jackrabbit Impacts?

McAdoo et al. 1987. Use of new rangeland seedings by black-tailed jackrabbits. J. Range Manage. 40:520-524.



Ongoing Study

Additional plots

We established additional plots in 2010

Treatments

- Panoramic
- Landmark
- Round-up (full rate)
- Round-up(half-rate)
- Untreated

Great Basin Native Plant Selection & Increase Project (USFS-Sponsored)

Transplanting Wyoming Big Sagebrush to Increase Seed Source Diversity

Kent McAdoo, UNCE Chad Boyd, USDA - ARS Roger Sheley, USDA - ARS John Swanson, UNR Clare Poulsen, USDA - ARS

Rationale for Planting "Island" Sagebrush Plants

- Recruitment from existing seedbanks unreliable/episodic (Perryman et al. 2001)
- Successfully planting seeds is unreliable (Shaw et al. 2005)
- But seedlings can be readily transplanted (McArthur et al. 2004)
- Shrub "islands" can serve as dispersed seed sources, accelerating site diversification (Longland & Bateman 2002)

Objectives - to determine the influence of:

- Site (3 plant communities)
- Reduction of herbaceous competition
- Plant source (wildings vs. nursery stock)

...on survival of sagebrush transplants

Collecting Wildings with a "Weed Wrench" ©





Study Sites

- Cheatgrass monoculture
- Crested wheatgrass monoculture
- Post-fire native herbaceous community

Treatments

- Treatments in randomized block design with 5 replications
- Spring-applied treatment of glyphosate (64 oz/ac) to reduce herbaceous cover.
- Each block includes eight 5m² plots representing factorial combinations of herbicide treatment, no herbicide treatment, year of planting, and plant source (native or nursery stock).
- Ten sagebrush plants were planted in each plot.

Sampling & Analysis

- Sagebrush density measured in Sept. by direct count
- Seedling height recorded for each surviving transplant
- Data will be analyzed for treatment effects using mixed model analysis of variance with block and treatment x block considered random and other effects fixed.

Timeline

- 2009, spring establish plots, spray herbicide, pull and plant sagebrush wildings, plant sagebrush nursery stock
- 2009, fall collect survival and robustness data
- 2010, spring & fall repeat as described above
- 2011 complete data analysis and prepare manuscript



90% Herbaceous Vegetation Control with Glyphosate



Preliminary Results

Cheatgrass Monoculture Site Sagebrush Transplant Survival

Source	Herb. Control	<u>% Survival*</u>
Nursery	Untreated	38 ^a
Nursery	Glyphosate	50 ^a
Wilding	Untreated	6 ^b
Wilding	Glyphosate	18 ^c

Crested Wheatgrass Monoculture Site Sagebrush Transplant Survival

Source	Herb. Control	<u>% Survival*</u>
Nursery	Untreated	40 ^a
Nursery	Glyphosate	46 ^a
Wilding	Untreated	4 ^b
Wilding	Glyphosate	10 ^c

Native Herbaceous (Post-fire) Site Sagebrush Transplant Survival

<u>Source</u>	Herb. Control	<u>% Survival*</u>
Nursery	Untreated	68 ^a
Nursery	Glyphosate	68 ^a
Wilding	Untreated	6 ^b
Wilding	Glyphosate	22 ^c

All Sites Combined Sagebrush Transplant Survival

<u>Source</u>	Herb. Control	<u>% Survival*</u>
Nursery	Untreated	49 ^a
Nursery	Glyphosate	55 ^a
Wilding	Untreated	5 ^b
Wilding	Glyphosate	17 ^c

Sagebrush Nursery Stock Robustness



HABITAT

Sagebrush Wilding Transplant Robustness



Second Growing Season



A special thanks to Steve Monsen, retired USFS range ecologist, for his advice & encouragement







