Colorado Plant Materials
All Plants Considered

2012

Photo by Anna Brownell

Bigelow's tansyaster *Machaeranthera bigelovii* (A.Gray), *Dieteria bigelovii*.
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Zapata Seed Mini Pivot and Native Vegetation Trials

Excerpts from Richard Sparks, USDA NRCS Area 4 and Anna Brownell, Zapata Seed, Inc.

Foreword and Introduction
By Christine Taliga, Plant Materials Specialist

The USDA NRCS Plant Materials Program is uniquely poised to bring the most updated and relevant conservation plant materials to farmers and ranchers through Farm Bill programs. One of the ways this task may be achieved is through evaluations of conservation plant materials under unique environmental conditions. Conservation field trials and conservation plant demonstrations, or field evaluations, are two methods that may be utilized by field offices to work with farmers and ranchers when questions arise related to the applicability for appropriate conservation plant materials or re-vegetation protocols and methods.

This newsletter highlights one such example and showcases the information technology transfer that may ensue when the Plant Materials Program, along with other resources, are utilized.

About the USDA NRCS PLANT MATERIALS PROGRAM

Did you know…..

- Plant Materials and Soils are the only two NRCS programs that conduct research.
- Technology transfer related to cover crops, ecological restoration projects, post-tamarisk removal re-vegetation projects, pollinators, seeding establishment and assessment, reclamation, riparian restoration, wetland development, and tree and shrub establishment are all plant materials program activities with resources available through your plant materials specialist.

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INTRODUCTION

Several years ago, as farmers and ranchers in the closed basin portion of the San Luis Valley (SLV) of Colorado faced the prospect of reducing pumping from their declining groundwater aquifers, a proposed CREP voluntary retirement of 40,000 irrigated acres was about to become a reality. Farmers and ranchers asked questions such as "What will grow without irrigation in a precipitation zone which sees 4 – 7 inches of rain annually?" "How do you bridge the transition from irrigated cropland to non-irrigated grassland?" and, "What is the minimum amount of water needed to establish vegetation?" The SLV is one of the toughest environments in Colorado, where wind erosion, drought, salinity, and soil compaction are everyday issues. These questions are of critical concern to the area's farmers and ranchers.

That's when a local potato grower, Brian Brownell stepped forward to offer the use of a "mini-pivot" on his farm near Hooper, Colorado to demonstrate which plant materials could be utilized to reseed areas in the valley that were once irrigated cropland.

Brian Brownell's present-day Zapata Seed Farms operation takes place on the same land that he grew up irrigating with siphon tubes and a shovel. Zapata Seed Farms now specializes exclusively in certified potato seed production under center pivot irrigation. Brian Brownell's agricultural education background, combined with his conservation ethic and community leadership, led the way to forge a partnership with both the local USDA NRCS office and Richard Sparks, Area 4 agronomist. Sparks spearheaded and coordinated this study with Colorado State University (CSU) Extension Water Resources Specialist Dr. Perry Cabot of Pueblo, and Merlin Dillon, Agronomist (retired) with CSU Extension Service at Center.

Utilizing the resources of the Plant Materials Program and financial assistance through CSU's Innovation Grants program and a NRCS CIG grant, this project began in 2009.

Figure 1: Showing modified nozzle of the mini-pivot

The project demonstrated 1) how 18 inches of irrigation over three years should be used to establish native vegetation that will persist without irrigation for another 12 years or longer; and 2) which varieties and species of forbs and grasses are uniquely suited to harsh soils and climate. Sparks & Dillon planned replicated plots to demonstrate species selections and various dates of seedings and irrigation treatments. Species were provided by the Plant Materials Program, Terry Hillin of Seed Solutions of Monte Vista, and Dean Swift, a local seed grower.

The following project summary has been provided by Richard Sparks.

The project demonstrates establishment of native vegetation on idled cropland in the San Luis Valley, Colorado. Individual demonstration plots (12' x 30') were planted with a plot-drill (0.5 inch seeding depth) on two different dates (May 27 and July 15). Emergence ratings for the individual species in these plots were initially assessed using ocular estimate of the percent of their expected final stand (Table 1). CSU is continuing monitoring by transects through NRCS CIG grant.

Cool Season Grasses

Native wheat grasses, like Thickspike and Streambank, did excellently initially. They have declined significantly in 2012. Western wheatgrass initially established more slowly, but has continued to increase. Western wheatgrass did emerge better from deeper depths. In 2012 it is superior to Thickspike or Streambank in aggressiveness (spreading from rhizomes) and vigor.

Figure 2: Western wheatgrass rhizomatous and deep roots.

Indian Ricegrass did not germinate well in summer seedings. Dormant seedings and early spring seedings germinated fairly well, but spring annuals (kochia & thistle) reduced establishment. Bottlebrush squirreltail and sand dropseed have not established as well as expected. All three of these species can spread from seed, and have the potential of filling in areas where poor stands were initially established.

Introduced species like crested wheatgrass and Russian wildrye initially did better than native species. In a mixture that is not grazed, they will tend to form "wolf plants" that kill out adjacent species, so will not be in any CREP recommended mixtures. They were included in this trial to evaluate this negative feature and to serve as borders to the quadrants.

Warm Season Grasses

Blue grama did very well and outperformed alkali sacaton in the May seeding. Blue grama cover established by the fall of 2009. Alkali sacaton did better than blue grama in the July seeding. Both initially struggled to compete with cool season species and annual weeds; by 2012, alkali sacaton is superior. Both have the potential of surviving the very low precipitation of the valley floor after irrigation is terminated. They tend to go dormant during drought better than wheat-grasses, and maintain better groundcover.

Figure 3: Blue grama breaking out of dormancy following a 1 inch rain in July 2012.

Forbs Mixture†

Louisiana sage, prairie coneflower, Lewis (Blue) flax, and tansy aster were included in the forbs mixture (Table 1). The forbs mix did establish fairly well. Forbs continue to persist well in 2012; Louisiana sage is impressive.

Lewis flax, Louisiana sagewort, prairie coneflower, and tansy aster emerged fairly well. All of these species are expected to do well during irrigated years of the establishment period. Once irrigation is terminated, blue flax and prairie coneflower will likely die out completely. Louisiana sagewort is expected to remain present in the long-term stand. Fringed sage evidently came in with the Louisiana sagewort, and also is establishing well.

Sweet clover and alfalfa were seeded in the bulk mixture at very low rates to see if they will provide a little nitrogen, ground cover, native pollinator habitat, and diversity for a few years. Alfalfa continues to survive in 2012. A local collection of Rocky Mt. Bee-plant (a nitrogen-producing native annual) was added to the dormant seeding. Limited emergence occurred. These will benefit native insect pollinators. Sweet clover is absent in 2012.

Shrubs & Half Shrubs

Fourwing saltbush (a shrub) had limited emergence. Winterfat (a half shrub) only established occasional plants. Fourwing saltbush will likely remain an important part of the long-term native plant community, giving a very natural shrub appearance. It will eventually grow to 3 feet in height. It continues a significant presence and is flowering in 2012. Including these forbs and shrubs will provide native wildlife habitat benefits. Fourwing saltbush will root deeply and

survive on moisture that exists below the normal rooting depth of the native grasses.

Figure 4: Louisiana sage and fourwing saltbush following a 1 inch rain in 2012. Note grasses growing in close proximity.

Dormant Seeding Plots

In November 2009, the same species above were planted in individual demonstration plots (12' x 30') with a plot-drill and a seed mixture area using a no-till drill to evaluate a dormant season planting. It is also important to note that although important Indian ricegrass germinated poorly, it did better in the dormant season planting. Dormant-seeded and early spring-seeded species all suffered from kochia and thistle competition.

Cover Crops

Cover crops to reduce weed competition and prevent wind erosion and damage to new seedlings are also being evaluated. Glyphosate-killed winter wheat cover worked well only if kochia and thistle are not allowed to harden off before application. Sorghum-sudan cover was established to protect the dormant season planting and next year's planned April seeding. These cover crops required 2 to 7 inches of irrigation water before perennial grasses were even planted. Sorghum-sudan cover failed to control annual weeds, and dormant seedings into this cover failed due to weed competition. Two plots were planted to a winter wheat cover again in 2011 but failed to survive winter. Kochia and thistle come on by midsummer; and even following two half inch applications of irrigation water, glyphosate failed to kill hardened weeds. The grass forb mixture was successfully seeded into the weeds. The weed cover, however, is requiring more irrigation.

Seed Placement

A mixture of all species was also planted using the Colorado Department of Wildlife's (CDOW) no-till drill on both dates. In general, a much better stand was obtained for the late (July 15) planting of the seed mixture areas, due to better seed placement. The depth of seeding presented itself as an important variable, since it was expected that the early (May 27) planting would have fared as well as the individual species plots, but the deeper seeding depth (1.5-2.0 inches) for the early seeding resulted in a poorer stand. The depth of the late seeding was around 1.0 inch and established well. The broadcast seeding had excessive weeds due to culti-packer incorporation. The seeding depth in 2012 was .75 to 1 inch deep. Initial emergence is good.

Figure 5: Mixture seeded 1 inch deep in July with CDOW No-Till Drill.

Irrigation

The mini-pivot was re-nozzled by Agro Engineering with pressure regulators and valves to allow irrigation of the outside 50% of the pivot area separate from the inside portion. April and November seedings required excessive amounts of irrigation water to establish even a marginal stand. The May and July seedings into herbicide-killed covers had much less weed pressure and the established stands required much less water. The limited irrigation" plots on the May and July seedings did as well as the fully irrigated plots.

Limited irrigation plots still had enough water remaining (18 inches maximum) to allow an extra 1.5 inches of water to be applied in the drought year of 2011. No irrigation was applied in 2012.

Figure 6: Richard Sparks, USDA NRCS Area Agronomist at the CREP trial site.

Conclusion:
The project has shown that vegetation may be established with limited irrigation, and showcased the following critical factors in this climate:

- Plant into a weed-free seedbed
- Include forbs and shrubs in the mix for wildlife benefits and diversity
- Use early and late successional plant species
- Time seedings for mid to late summer.
- Avoid dormant seedings if annual weeds are problematic
- Plant less than 1 inch for most species
- Monitor irrigations and establishment over several years to ascertain success
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Plant recommendations :

1. Western wheatgrass
2. Indian ricegrass (should be dormant planted)
3. Use Thickspike and Streambank wheatgrass (only for quick cover)
4. Blue grama
5. Alkali sacaton
6. Mixed forbs and shrubs (Louisiana and fringed sage, winterfat, fourwing saltbush, Bigelow's tansy aster, alfalfa and sweet clover)

Do not include:
Crested wheatgrass
Russian wildrye

Spearheaded locally by the leadership of Brian Brownell with the technical expertise of Area agronomist Richard Sparks, this partnership has resulted in combining resources from the private sector, CSU Extension and Farm Bill programs (Plant Materials and Conservation Innovation Grant) together to demonstrate seeding dates and plant materials that may be utilized to address emerging conservation concerns on the local level.

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If you are interested in working with a local landowner or partner on a field trial or demonstration project that addresses a local need, please contact your Plant Materials Area representative.

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Tables

Table 1. Emergence ratings (2009) native species establishment trial in Hooper, CO.

	Full Irrigation		*Limited Irrigation*	
Grass Species	*May 27*	*July 15*	*May 27*	*July 15*
Indian Ricegrass	3%	0%	4%	0%
Thickspike Wheatgrass	73%	20%	70%	20%
Alkali Sacaton	55%	23%	30%	30%
Blue Grama	73%	16%	38%	8%
Sand Dropseed	11%	18%	6%	20%
Bottlebrush Squirreltail	43%	19%	30%	9%
Streambank Wheatgrass	73%	24%	70%	15%
Western Wheatgrass	48%	28%	39%	11%
Forbs Mixture†	48%	15%	40%	15%
Crested wheat-Russian	65%	40%	78%	28%
Mean Values	**49.20%**	**20.30%**	**40.50%**	**15.60%**

†Louisiana sage, Four Wing Saltbush, Winterfat, , Prairie Coneflower, Lewis (Blue) flax, Alfalfa, Yellow Sweet clover

Table 2.

Summary of Irrigations & Precipitation on the Plots

		Three year growing season ppt	May seed Grass Limited irr	May seed Grass Full irr (outer)	July Seed Grass Limited Irr	July Seed Grass Full Irr (outer)	Nov Seed Limited Irr	Nov Seed Full Irr (outer)	April 2010 Seed, Limited	April 2010 Seed, Full (outer)
winter cover	08	1	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
winter Cover	09		1.3	1.3	1.3	1.3	6.6	6.6	6.6	6.6
Sordan cc	09						5.3	5.3	5.3	5.3
Year 1	09	3.2	8.2	10.6	6.8	7.6	0	0	0	0
Year 2	10	1.1	3.9	5.6	3.9	5.6	11.9	17.2	11.9	17.2
Year 3	11	?	3.3	1.8	3.3	1.8	disked	1.8	disked	1.8
3 year total		4.3	17.5	20.1	16	17	19.25	26.35	19.25	26.35

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