

Improved Plant Materials for Fall and Winter Forage

On western rangelands where winter feeding of harvested forage is economically limiting, the use of stockpiled grasses, legumes, and forbs as a source of fall and winter forage is gaining in popularity.

- Develop tall-statured forage kochia cultivars.
- Document fall and winter livestock performance on forage kochia.



Fall grazing of forage kochia and crested wheatgrass

- Develop a better understanding of the interaction between species (grasses, legumes, and forbs, shrubs) and plant density and their effects on forage production and persistence on semi-arid rangelands.

Outcomes

1. Release of cultivar Mustang Altai wildrye (2004) with increased seedling vigor for fall and winter forage.
2. Develop new forage kochia cultivars with increased stature and productivity primarily for livestock and wildlife grazing.
3. Document the economic benefit of forage kochia as a fall and winter forage.
4. Better understand species and their interactions with species and plant spacing such that optimal forage production is achieved.



Prairieland Mustang



Fall/Winter grazing of forage kochia

Seed available from the Utah Crop Improvement Association
1-435-797-2082

ARS Mission

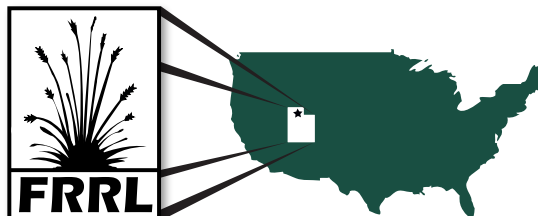
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- enhance the natural resource base and the environment, and
- provide economic opportunities for rural citizens, communities, and society as a whole.



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PLANTS FOR THE WEST

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**BIOMASS/BIOFUELS
RESEARCH**

Forage and Range Research Laboratory



BIOMASS/BIOFUELS

VISION

To maximize forage productivity and biofuel potential of rangelands receiving 12 to 18 inches of annual precipitation by using improved plant materials.

RESEARCH OBJECTIVES

1. Develop high biomass/biofuel grass germplasm and cultivars for semi-arid regions of the western U.S.
2. Develop improved plant genetics/cultivars for disturbed mine land restoration.
3. Develop genomic resources to enhance the development of improved legumes and forbs adapted to semi-arid rangelands of the western U.S.
4. Develop new forage cultivars adapted to semi-arid rangelands of the western U.S. for fall and winter forage.



Production field of Basin wildrye

PLANTS

High-Biomass/Biofuel Perennial Grass Feed Stock

Develop high biomass perennial grass germplasm and cultivars for semi-arid regions of the western U.S.

- Develop improved grass cultivars that have increased biomass, are more persistent, with enhanced forage quality (higher digestibility, high sugar content, and lower fiber).
- Develop new genomic resources for use in cultivar improvement.
- Develop protocols for hybrid seed production.

Outcomes

1. Provide high yielding intermediate and tall wheatgrasses and Great Basin wildrye cultivars with improved nutritional quality and stand establishment for use on semi-arid rangelands.

2. Develop molecular genetic tools to identify genes and enhance cultivar development for biomass, quality, seed production, germination, and seedling establishment.



Great Basin wildrye hybrid field

3. Develop methods and parent combinations for commercial hybrid seed production in Great Basin wildrye and other grass hybrids.

Enhance Plant Genetics for Disturbed Mine Land Restoration

Heavy-metal tolerance breeding and genetics in perennial grasses has received little attention. Hence, there is a great opportunity for breakthroughs in this area. Moreover, genes controlling tolerance to these problems have not been adequately characterized. Thus, genes controlling heavy-metal tolerance will be identified in Great Basin wildrye.

- Identify and improve grass species capable of establishing, persisting, and excluding heavy metal (arsenic, selenium, N, P, K, Ca, Mg, Fe, Zn, Mn, Cu, Na, and S) uptake in contaminated soil.
- Develop new genomic resources for use in cultivar improvement.



Left: treated mine site Right: untreated site

Outcomes

1. Identify species that will germinate when seeded in heavy-metal soils.
2. Identify species that persist and exclude heavy metals when grown in heavy-metal soils.
3. Identify genes for metal tolerance in Great Basin wildrye and creeping wildrye.

Improved Legume/Forb Germplasm for Arid Regions of the Western U.S.

Develop new genomic resources and legume cultivars adapted to semi-arid rangelands of the western U.S. with increased seedling vigor and forage quality.

- Develop dryland alfalfa with increased forage production.
- Genetically characterize tetraploid and diploid yellow-flowered falcate-type alfalfas.
- Develop sainfoin and Utah sweetvetch cultivars with increased seed production and biomass.



Dryland alfalfa

Outcomes

1. Alfalfa cultivars with increased yield and persistence under dryland conditions.
2. Sainfoin populations with improved persistence, and forage production, particularly under dry conditions.
3. Improved cultivars of Utah sweetvetch with increased seed production, seedling establishment, persistence, and forage production.



Sainfoin breeding population



Utah sweetvetch breeding population