

TECHNICAL NOTE

USDA - Natural Resources Conservation Service
Boise, Idaho

TN Plant Materials NO. 62

January 2014

CHALLIS, IDAHO DEMONSTRATION PLANTINGS SUMMARY: 1980 - 2013

Derek J. Tilley, Agronomist, Plant Materials Center, Aberdeen, Idaho
Rosana Rieth, Rangeland Management Specialist, Challis, Idaho
Daniel G. Ogle, Range and Plant Materials Specialist, Boise, Idaho (retired 2012)
Loren St. John, Team Leader, Plant Materials Center, Aberdeen, Idaho



Round Valley demonstration site, Custer County, Idaho

This technical note provides 30+ years of data from six rangeland plantings in areas surrounding Challis, Idaho. The plantings were evaluated every 3- 4 years for plant establishment, stand, survival, plant density, plant vigor, resistance to insects, resistance to drought, ability to spread, height, competitive ability, plant production estimates and seed production. This report summarizes all available evaluations for stand, plant density and the species' estimated ability to spread.

Introduction

Six demonstration plantings were seeded in the Challis, Idaho NRCS Field Office service area in Custer County, Idaho between 1980 and 1982 as a part of the Challis Experimental Stewardship Program. The objective of these plantings was to determine and display species and cultivars (varieties) of grasses, forbs, legumes and shrubs adapted for use in rangeland rehabilitation and the improvement of wildlife habitat. Many agencies, including USDA NRCS (SCS), USDI BLM, USDA FS and Idaho Department of Lands contributed to the establishment of this project. Long term demonstration planting evaluations were the responsibility of USDA NRCS.

Climate

The average annual precipitation for Challis is 7.70 inches. However, the foothill areas receive more precipitation, as much as 20 inches or more at higher elevations to the north, west and south of Challis. The growing season is quite short in most of the area, from 50 to 100 days. During this growing period, about 30 to 40 percent of total annual precipitation typically falls at lower, warmer elevation sites. Most of this growing season precipitation occurs from mid-April to early-June with June through August being fairly dry. The heaviest 1-day precipitation amount during the period of record was 1.85 inches at Challis on July 10, 1983. The years between 1982 and 1984 were good precipitation years as total annual amounts were between 2 and 3.5 inches above average. This likely resulted in good initial establishment of many of the species at the demonstration plantings. Between the years of 1985 and 1989, precipitation was below average. 1988 in particular was a drought year with the area only receiving 4.77 inches of precipitation. In effect, the mid 1980s through the next 20 years were either average or drier than average for the area with the occasional occurrence of a slightly above average precipitation year.

Materials and Methods

Six fenced enclosure sites were seeded, Jeff's Flat, Round Valley, Bradbury Flat (two plantings), Centennial Flat, Gooseberry Creek and Spud Alluvial (figure 1). Each enclosure was divided into two areas with one half left with native vegetation and the other half scalped and prepared for seeding. All seedings were made in the scalped area. Drilled areas were worked with a spring tooth harrow for seedbed preparation. Grasses, legumes, and forbs were seeded in 3 rows, one foot apart, 30 feet long with a John Deere double disc drill with packer wheels. The shrubs were greenhouse grown transplants individually planted in 100 foot rows 5 feet apart with 3 foot within row spacing.



Figure 1. Map of Challis area demonstration plantings.

The plantings were evaluated every 3- 4 years by many NRCS employees. Plant characteristics evaluated and rated include establishment, stand, survival, plant density, plant vigor, resistance to insects, resistance to drought, ability to spread, height, competitive ability, plant production estimates and seed production. However evaluations were not consistent through the 30(+) years. This report summarizes all available evaluations for stand, plant density and the species' estimated ability to spread.

In some years, stand rating was rated on a 1-9 scale (1 being best and 9 being worst), while in other years it was rated on a percent cover basis. This report lists evaluations as they were conducted in the field and a valid comparison of species and accessions can be inferred.

The method of evaluating ability to spread varies from one evaluation to the next. In some cases a single rating is given. In other cases ability to spread was divided into spread by seed and vegetative spread (rhizomatous) and given separate ratings. In a few instances it seems that only vegetative spread is considered as all non-rhizomatous species were given a "non-applicable" rating. In this report we attempt to capture the intention of the evaluator. In instances where separate ratings for vegetative and seed spread were recorded, we provide here the average of those scores.

Several accessions being investigated in this study were formally released in later years following the establishment of these plantings. To avoid confusion, the current release names are given.

Many accessions in the six plantings either failed to establish or did not persist. Rather than filling the attached tables with zeros, the authors have chosen to leave cells blank in which there is no rating due to a failed stand. This should make the report easier to read.

Spud Alluvial

The Spud Alluvial demonstration site is located approximately 30 miles southwest of Challis (44.228549, -114.299698). This site lies at an elevation of 5570 ft and receives 7 to 11 inches mean annual precipitation. The soils at the location are Whiteknob gravelly loam with 2 to 8% slopes. The native plant community is dominated by Wyoming big sagebrush and bluebunch wheatgrass.

Records indicate that the ground was frozen and rocky at the time of seeding with the resulting seedbed being fair at best. Despite poor seeding conditions, 16 of 24 planted species established to some extent.



The Spud Alluvial demonstration planting area, July 2007.

Spud Alluvial stand rating							
	1989 ¹	1992 ¹	1995 ¹	1999 ¹	2003 ²	2007 ²	2013 ²
GP-52 synthetic alfalfa	5	8	3	7			
BC-79 synthetic alfalfa	4	8	7	7			
RS-1 bluebunch x quackgrass	8	7			85		
RS-2 bluebunch x quackgrass	7	5			85		
Fairway crested wheatgrass	2	2	1		85	87	30
Immigrant forage kochia	7	6	1		50	85	70
Scarlet globemallow	8	8					
Bandera Rocky Mt. penstemon							
Cedar Palmer's penstemon							
Appar blue flax							
Paiute orchardgrass							
Ephraim crested wheatgrass	6	7	3	5	75	15	30
Barton western wheatgrass		9			2		
Topar pubescent wheatgrass	7	9	9	9			
Whitmar beardless wheatgrass	5	4	2	1	70	35	2
P-27 Siberian wheatgrass	3	2	2	1	90	90	60
Goldar bluebunch wheatgrass	5	8	4	7	25	2	
Secar Snake River wheatgrass	3	3	3	3	80	50	15
Nezpar Indian ricegrass							
Magnar basin wildrye							
Vinall Russian wildrye	5	3	2	3	85	75	25
Bozoisky Select Russian wildrye	3	3	2	3	85	85	20
Yellow sweetclover				*	*		
Nordan crested wheatgrass	3	2	2	*	*	95	70

¹ rated on a 1-9 scale (1=best, 9= worst)

² rated as percent cover using line intercept method

* No record of evaluation



Mark Olson and Dan Ogle evaluating the Spud Alluvial demonstration site in 2007.

Spud Alluvial plant density¹							
	1989	1992	1995	1999	2003	2007	2013
GP-52 synthetic alfalfa	0.4		0.4				
BC-79 synthetic alfalfa	0.4		0.1				
RS-1 bluebunch x quackgrass	0.1				1.5		
RS-2 bluebunch x quackgrass	0.3				1.5		
Fairway crested wheatgrass	1.1		2.0		1.5	0.7	0.4
Immigrant forage kochia	0.1		1.0	2.0	2.0	1.0	1.0
Scarlet globemallow	0.1						
Bandera Rocky Mt. penstemon							
Cedar Palmer's penstemon							
Appar blue flax							
Paiute orchardgrass							
Ephraim crested wheatgrass	0.5		1.0	2.0	1.0	0.2	0.4
Barton western wheatgrass					0.1		
Topar pubescent wheatgrass	0.4		0.1	1.0			
Whitmar beardless wheatgrass	0.5		1.0	1.0	1.0	0.3	
P-27 Siberian wheatgrass	1.0		1.5	1.0	1.5	1.25	0.8
Goldar bluebunch wheatgrass	0.5		0.4	7.0	0.3	0.1	
Secar Snake River wheatgrass	0.3		0.8	0.7	0.75	0.8	0.3
Nezpar Indian ricegrass							
Magnar basin wildrye							
Vinall Russian wildrye	0.3		1.0	1.5	1.0	0.8	0.5
Bozoisky Select Russian wildrye	0.3		0.9	0.5	0.75	1.0	0.3
Yellow sweetclover							
Nordan crested wheatgrass	1.0		1.5	*	*	1.5	0.7

¹ Plants/ft²

* No record of evaluation

Immigrant forage kochia, P-27 Siberian wheatgrass, Vinall Russian wildrye, and Nordan crested wheatgrass all had fair to good stands at the time of the 2013 evaluation. Ephraim and Fairway crested wheatgrass, Secar Snake River wheatgrass and Bozoisky Russian wildrye also had fair plant densities throughout much of the life of the planting. The 7.0 plants/ft² recorded for Goldar bluebunch wheatgrass in 1999 is most likely a mistake made while recording the data. There is a footnote on the evaluation sheet stating that only 5 plants remained in the entire plot. Dividing those 5 plants by the 90 ft² area of the plot comes to 0.06 plants/ft².

Spud Alluvial ability to spread¹							
	1989	1992	1995	1999	2003	2007	2013
GP-52 synthetic alfalfa			5	7			
BC-79 synthetic alfalfa			7	7			
RS-1 bluebunch x quackgrass							
RS-2 bluebunch x quackgrass							
Fairway crested wheatgrass	4.5		3			5	5
Immigrant forage kochia	2		2	3	1	1	1
Scarlet globemallow							
Bandera Rocky Mt. penstemon							
Cedar Palmer's penstemon							
Appar blue flax							
Paiute orchardgrass							
Ephraim crested wheatgrass	4		4	5		7	5
Barton western wheatgrass					7		
Topar pubescent wheatgrass	6		7				
Whitmar beardless wheatgrass			4	7	4		
P-27 Siberian wheatgrass	3		3	6			5
Goldar bluebunch wheatgrass			6	9			
Secar Snake River wheatgrass			5	5			7
Nezpar Indian ricegrass							
Magnar basin wildrye							
Vinall Russian wildrye			4	5	7	5	7
Bozoisky Select Russian wildrye	7		4	7	7	3	7
Yellow sweetclover							
Nordan crested wheatgrass	5		3	*	*	2	3

¹ rated on a 1-9 scale (1=best, 9= worst)

* No record of evaluation

Numerous Immigrant forage kochia volunteers were observed in 2003. In 2007, Immigrant forage kochia was reported outside of the exclosure and by 2013 (30+ years), had spread 30-50 feet (approximately 1- 2 ft/year) from the original planting. In 2013, the Russian wildrye, rated with low ability to spread, had spread via seed approximately 10 feet beyond the plots, but it was unclear which accession had moved. The site is dominated by crested and Siberian wheatgrasses both inside and outside the exclosure making it difficult to determine what has moved from which plots of those species.

Centennial Flat

The Centennial Flat demonstration planting site is located at 44.353729, -114.302423, approximately 10 miles southwest of Challis. The elevation of the site is approximately 6,100 ft elevation, and the soils are Venum-Cronks complex gravelly loam. The area receives an estimated 8 to 12 inches mean annual precipitation and is dominated by Wyoming big sagebrush and bluebunch wheatgrass.



Centennial Flat demonstration planting site, 2007.

No evaluation occurred in 2013. There was also no record of an evaluation of this site in 1999.

Centennial Flat stand rating	1989 ¹	1992 ¹	1995 ¹	2003 ²	2007 ²
GP-52 Synthetic alfalfa	7	4	2	10	10
BC-79 Synthetic alfalfa	5	4	2	3	15
RS-1 bluebunch x quackgrass		8		25	
RS-2 bluebunch x quackgrass		4		15	
Fairway crested wheatgrass	5	2		75	
Lutana cicer milkvetch	2	7	7		1
Canbar Canby's bluegrass		5			
Immigrant forage kochia					
Scarlet globemallow	9	3	9	1	3
Bandera Rocky Mt. penstemon					
Cedar Palmer's penstemon					
Appar blue flax	7	2	6		
Paiute orchardgrass	9				
Ephraim crested wheatgrass	2	3	1	85	70
Barton western wheatgrass		4		5	5
Topar pubescent wheatgrass	3	4	3	1	15
Whitmar beardless wheatgrass	6	5	7	25	65
P-27 Siberian wheatgrass	2	3		0	2
Goldar bluebunch wheatgrass	7	3	4	25	25
Secar Snake River wheatgrass	8	4	4	50	40
Nezpar Indian ricegrass					
Magnar basin wildrye					
Vinall Russian wildrye	6	4	3	60	60
Bozoisky Russian wildrye	5	4	2	45	40
Yellow sweetclover					
Ladak alfalfa	9	7	9	1	
Nordan crested wheatgrass	3	2	2	70	75

¹ rated on a 1-9 scale (1=best, 9= worst)

² rated as percent cover using line intercept method

This site had the best diversity in establishment of the six plantings. Only Immigrant forage kochia, Bandera penstemon, Palmer's penstemon, Nezpar Indian ricegrass and Magnar basin wildrye failed to establish. Ephraim crested wheatgrass, Whitmar beardless wheatgrass, Vinall and Bozoisky Russian wildrye and Nordan crested wheatgrass all had high stand ratings from the 2007 evaluation. Most accessions maintained some level of a stand throughout the life of the planting, either with long-lived plants or by natural seed recruitment and spread.

Centennial Flat plant density and spread	Density ¹				Spread ²			
	1989	1995	2003	2007	1989	1995	2003	2007
GP-52 Synthetic alfalfa	0.2	1	0.1	0.1	7	3	5	5
BC-79 Synthetic alfalfa	0.3	1	0.05	0.2	7	3	5	4
RS-1 bluebunch x quackgrass			0.5					
RS-2 bluebunch x quackgrass			0.25					
Fairway crested wheatgrass	0.5		1.0		5		7	
Lutana cicer milkvetch	0.1	0.2		0.1	7	3		7
Canbar Canby's bluegrass								
Immigrant forage kochia								
Scarlet globemallow	0.7	0.1	0.1	0.1	9	7		6
Bandera Rocky Mt. penstemon								
Cedar Palmer's penstemon								
Appar blue flax	0.2	0.5			5	5	6	
Paiute orchardgrass								
Ephraim crested wheatgrass	1.3	1.6	1.25	0.8	3	1		5
Barton western wheatgrass	0		0.25	0.1			7	4
Topar pubescent wheatgrass	1.4	1.0	0.1	0.3	1	3		4
Whitmar beardless wheatgrass	0.1	0.1	0.25	1.0	4	5	5	3
P-27 Siberian wheatgrass	0.9	1.5	0	0.1	2	5		9
Goldar bluebunch wheatgrass	0.2	0.5	0.5	0.5	4	3	5	5
Secar Snake River wheatgrass	0.1	0.3	0.75	0.5	4	5	5	5
Nezpar Indian ricegrass								
Magnar basin wildrye								
Vinall Russian wildrye	0.6	0.5	0.75	0.7	3	5		7
Bozoisky Russian wildrye	0.4	0.5	0.25	0.3	2	5		5
Yellow sweetclover								
Ladak alfalfa		0.5	0.1				6	
Nordan crested wheatgrass	0.8	1.0	0.75	1.0	2	5	6	7

¹ Plants/ft²

² rated on a 1-9 scale (1=best, 9= worst)

Good densities were achieved by several accessions at the Centennial Flat site. Most of these (Ephraim crested wheatgrass, Goldar bluebunch wheatgrass, Secar Snake River wheatgrass, Vinall Russian wildrye and Nordan crested wheatgrass) established well and maintained vigorous stands. Whitmar beardless wheatgrass had poor initial plant densities but increased over time to rival Nordan crested wheatgrass at the 2007 evaluation.

Jeff's Flat

The Jeff's Flat demonstration planting is located approximately 6 miles northwest of Challis (44.542114, -114.341991) at an elevation of 6,600 ft. The soils at the site are Nielsen-Gaciba association gravelly loam soils. Average annual precipitation ranges from 12 to 16 inches, supporting a bluebunch wheatgrass, Idaho fescue and mountain big sagebrush plant community.

The Jeff's Flat site could not be visited in 2013 due to wildfires. There were also no records of an evaluation for 1995 due to road maintenance issues.



Jeff's Flat demonstration planting area, 2007.

Jeff's Flat stand rating	1989 ¹	1992 ¹	1999 ¹	2003 ²	2007 ²
GP-52 Synthetic alfalfa	7	4	9	2.5	5
BC-79 Synthetic alfalfa	7	4	9	2.5	3
RS-1 bluebunch x quackgrass	8	5			
RS-2 bluebunch x quackgrass	8	6			
Fairway crested wheatgrass	1	2			
Delar small burnet					
Lutana cicer milkvetch	7	8	9		
Manchar smooth brome		8	1	50	25
Baylor smooth brome	7	6		50	10
Covar sheep fescue	5	2	1	45	75
Durar hard fescue	7	3	5	75	90
Bandera Rocky Mountain penstemon					
Cedar Palmer's penstemon					
Appar blue flax		5			
Whitmar beardless wheatgrass	3	3			
Paiute orchardgrass					
Ephraim crested wheatgrass	2	4	7	25	10
P-27 Siberian wheatgrass	1	3	9	40	20
Greenar intermediate wheatgrass	4	5	9	65	5
Sherman big bluegrass	5	6			
Magnar basin wildrye	5	8		5	5
Vinall Russian wildrye	2	3		3	8
Bozoisky Russian wildrye	3	3	5	5	8
Yellow sweetclover	2				5
Ladak alfalfa		4			
Nordan crested wheatgrass	3	3			

¹ rated on a 1-9 scale (1=best, 9= worst)

² rated as percent cover using line intercept method

P-27 Siberian wheatgrass, Fairway crested wheatgrass, Ephraim crested wheatgrass, Vinall Russian wildrye and yellow sweetclover produced the best initial stands. Yellow sweetclover, a biennial, apparently disappeared for several seasons (very typical for the species) but had a modest stand in 2007. Over time the wheatgrasses and wildryes were surpassed by Covar sheep fescue and Durar hard fescue which had the top stand ratings in 2007. The adjacent plots of smooth brome appear to have been difficult to discern. In 1989, Manchar smooth brome was rated as having no established plants while Baylor smooth brome was rated as a 7. In the 1999 evaluation Manchar had obtained a 1 rating, while Baylor scored a 0. Separating the two cultivars from one another is nearly impossible and no conclusions of performance should be taken at an accession level, but as a generalization for the species.

Jeff's Flat plant density and spread	Density ¹				Spread ²			
	1989	1999	2003	2007	1989	1999	2003	2007
GP-52 Synthetic alfalfa	0.1	1.0	1.0	0.1	7	4	7	N/A
BC-79 Synthetic alfalfa	0.1	1.0	1.0	0.1	7	4	7	N/A
RS-1 bluebunch x quackgrass								
RS-2 bluebunch x quackgrass								
Fairway crested wheatgrass	0.8				7			
Delar small burnet	0							
Lutana cicer milkvetch	0	1.0						
Manchar smooth brome	0	4.0	4.5	0.3		5	1	3
Baylor smooth brome	0.2		4.5	0.1	3		1	3
Covar sheep fescue	0.2	3.0	1.5	1.5		1	9	3
Durar hard fescue	0.2	1.0	3.0	2.0	3	7	7	1
Bandera Rocky Mountain penstemon								
Cedar Palmer's penstemon								
Appar blue flax								
Whitmar beardless wheatgrass	0.2				3			
Paiute orchardgrass								
Ephraim crested wheatgrass	1.5	1.0	0.5	0.1	2	2	0	N/A
P-27 Siberian wheatgrass	1.4	1.0	0.75	0.2	2	7	7	N/A
Greenar intermediate wheatgrass	0.2	1.0	4.0	0.1	3	9	1	3
Sherman big bluegrass	0.8				5			
Magnar basin wildrye	0.2		0.1	0.1	5		0	N/A
Vinall Russian wildrye	0.8		0.1	0.1	4		0	3
Bozoisky Russian wildrye	0.7	1.0	0.1	0.1	4	5	0	3
Yellow sweetclover	0.7			0.1	2			N/A
Ladak alfalfa								
Nordan crested wheatgrass	1.3				4			

¹ Plants/ft²

² rated on a 1-9 scale (1=best, 9= worst)

Jeff's Flat was one of a handful of high precipitation planting sites that favored the fine fescues over introduced wheatgrasses and wildryes. Covar sheep fescue and Durar hard fescue started with low plant densities but by the 2007 evaluation had densities of 1.5 and 2.0 plants/ft² respectively. Conversely Ephraim crested wheatgrass, P-27 Siberian wheatgrass, Vinall Russian wildrye and Bozoisky Russian wildrye all started with excellent initial establishment but reduced in density as the years progressed. Nordan crested wheatgrass was recorded in 1989 but did not

show up on future evaluation sheets, thus the blank cells for the 1999-2007 seasons do not necessarily indicate a lack of plants.

Higher precipitation at Jeff's Flat also facilitated spread by rhizomatous species. Both smooth brome accessions began with low plant densities but showed dramatic ability to spread by the 2003 evaluation. The fine fescues again appeared difficult to differentiate. The ability of Covar sheep fescue to spread was rated excellent in 1999 but no spread in 2003. Durar received a 7 for spread in 2003 and a 1 in 2007.

Bradbury Flat

The Bradbury Flat demonstration planting site is located 3 miles southeast of Challis (44.420310, -114.1530353). Pre-existing vegetation on the Bradbury site included Indian ricegrass, bottlebrush squirreltail, Nevada bluegrass, Sandberg bluegrass, needle-and-thread, shadscale, budsage, rubber rabbitbrush, Wyoming big sagebrush, winterfat, Nuttall's saltbush, and prickly pear cactus. The site receives 7 to 9 inches precipitation annually. The site sits at 5,400 ft elevation on the Whiteknob soil series consisting of deep, well drained soils formed in mixed alluvium.



Bradbury Flat demonstration planting site, 2007.

The Bradbury Flat demonstration planting trial incorporated a more complex experimental design than the other sites and is in essence two separate planting trials. The project design included a 1980 spring and fall (dormant) planting of selected plant materials. For the most part the accessions were the same in both seedings. Three seedbed preparation techniques were used: 1) disked to smooth the soil surface, 2) chiseled 4 to 6 inches deep and then disked, and, 3) chiseled 8 to 10 inches and then disked. The different techniques were conducted parallel to each other. Three rows, 45 feet long of each species were drilled perpendicular and across the seedbed preparation techniques. These treatments were not specified in evaluation sheets. No distinction is made in the results section on seedbed preparation methods, only species.

Little difference in establishment was recorded between spring and fall seeded plots. Crested and Siberian wheatgrasses established well from both seeding dates. Secar Snake River wheatgrass had a very good stand from the fall seeding and no recorded stand the first year in the spring seeding. However by 1992, the fall and spring seedings showed equally good stands. Both Russian wildrye accessions (planted only in the fall seeding) showed no stand during the 1989 evaluation, but developed into excellent stands over time.

Plant densities reflect the stand ratings. AB-447 crested wheatgrass (spring and fall seeded), spring seeded Secar Snake River wheatgrass, and fall seeded winterfat accessions had excellent densities over 1.0 plants/ft². At the time of the 2013 final evaluation the best densities were recorded for spring seeded Ephraim crested wheatgrass, spring seeded winterfat, spring seeded Sodar streambank wheatgrass and fall seeded Russian wildrye accessions.

Bradbury Flat stand rating	Fall Seeding						Spring Seeding						
	1989 ¹	1992 ¹	1995 ¹	1999 ¹	2003 ²	2013 ²	1989 ¹	1992 ¹	1995 ¹	1999 ¹	2003 ²	2013 ²	
Ephraim crested wheatgrass	5	8	4	4	50		Ephraim crested wheatgrass	5	3	3	2	70	70
P-27 Siberian wheatgrass	4	8	5	4	60		P-27 Siberian wheatgrass	5	4	3	3	65	20
Sodar streambank wheatgrass		6	4	5	80		Sodar streambank wheatgrass	5	6	5	4	65	20
Nezpar Indian ricegrass	8	9					Nezpar Indian ricegrass		9	9			
Luna pubescent wheatgrass							Luna pubescent wheatgrass	7					
AB-447 crested wheatgrass	5	4	3	3	65		AB-447 crested wheatgrass	3	7	2	3	60	30
Goldar bluebunch wheatgrass							Goldar bluebunch wheatgrass	7	9		9		
Magnar basin wildrye							Magnar basin wildrye						
Topar pubescent wheatgrass							Topar pubescent wheatgrass	2					
Secar Snake River wheatgrass	3	2	4	4	50		Secar Snake River wheatgrass		2	3	3	60	
Appar blue flax							Appar blue flax						
Firecracker penstemon							Firecracker penstemon						
Bandera Rocky Mt. Penstemon							Bandera Rocky Mt. penstemon						
Palmer's penstemon							Palmer's penstemon						
Alpine penstemon							Alpine penstemon						
Hatch Winterfat	2	4	4	3	1	50	AB-555 aster						
AB-764 Winterfat	3	4	3	3	20	50	AB-677 aster						
Blackeyed susan							Hatch winterfat						50
AB-922 fourwing saltbush	6	5	5.5		3	2	764 winterfat						50
AB-942 fourwing saltbush	6	5	7		2	2	Blackeyed Susan						
Delar small burnet							AB-922 fourwing saltbush		7				50
Immigrant forage kochia	5	3	5	7	3	5	AB-942 fourwing saltbush		9				50
Bozoisky Russian wildrye		2	3	2	70	60	Delar small burnet						
Vinall Russian wildrye		3	3.5	3	70	30	Immigrant forage kochia						1
Lodorm green needlegrass		8					Ladak alfalfa		4	8	7	1	
Blair smooth brome		8					Buckwheat						
Paiute orchardgrass							Arrowleaf balsamroot						

¹ rated on a 1-9 scale (1=best, 9= worst)

² rated as percent cover using line intercept method

Bradbury Flat plant density ¹	Fall Seeding					Spring Seeding					
	1989	1995	1999	2003	2013	1989	1995	1999	2003	2013	
Ephraim crested wheatgrass	0.3	0.5	1.5	0.5		Ephraim crested wheatgrass	1.0	0.5	1.5	1.0	1.0
P-27 Siberian wheatgrass	0.3	0.3	1.5	0.75		P-27 Siberian wheatgrass	1.0	0.4	1.5	0.5	0.2
Sodar streambank wheatgrass		0.8	2.0	1.25		Sodar streambank wheatgrass		0.3	2.0	1.5	1.0
Nezpar Indian ricegrass						Nezpar Indian ricegrass		0.1			
Luna pubescent wheatgrass						Luna pubescent wheatgrass	1.0				
AB-447 crested wheatgrass	1.3	0.6	1.5	0.5		AB-447 crested wheatgrass	12.0	0.6	1.5	0.5	0.4
Goldar bluebunch wheatgrass						Goldar bluebunch wheatgrass	1.0		0.5		
Magnar basin wildrye						Magnar basin wildrye					
Topar pubescent wheatgrass						Topar pubescent wheatgrass					
Secar Snake River wheatgrass	0.6	0.5	1.0	0.25		Secar Snake River wheatgrass	4.0	0.5	0.5	0.25	
Appar blue flax						Appar blue flax					
Firecracker penstemon						Firecracker penstemon					
Bandera Rocky Mt. Penstemon						Bandera Rocky Mt. penstemon					
Palmer's penstemon						Palmer's penstemon					
Alpine penstemon						Alpine penstemon					
Hatch Winterfat	1.1	1.0	4.0	0.1	0.7	AB-555 aster					
AB-764 Winterfat	1.1	1.0	4.0	0.15	0.7	AB-677 aster					
Blackeyed susan						Hatch winterfat				0.5	0.7
AB-922 fourwing saltbush	0.2	0.3		0.1	0.1	764 winterfat				0.5	0.7
AB-942 fourwing saltbush	0.2	0.2		0.1	0.1	Blackeyed Susan					
Delar small burnet						922 fourwing saltbush				0.1	
Immigrant forage kochia	0.2	0.3	0.5	0.1	0.1	942 fourwing saltbush				0.1	
Bozoisky Russian wildrye		1.0	3.0	0.5	0.8	Delar small burnet					
Vinall Russian wildrye		1.7	3.0	0.7	0.8	Immigrant forage kochia					
Lodorm green needlegrass						Ladak alfalfa		0.1	0.5		
Blair smooth brome						Buckwheat					
Paiute orchardgrass						Arrowleaf balsamroot					

¹ Plants/ft²

Bradbury Flat ability to spread ¹	Fall Seeding				Spring Seeding			
	1995	1999	2003	2013	1995	1999	2003	2013
Ephraim crested wheatgrass	4	3	5		Ephraim crested wheatgrass	4	3	2
P-27 Siberian wheatgrass	4	3	5		P-27 Siberian wheatgrass	3	3	2
Sodar streambank wheatgrass	3	2	1		Sodar streambank wheatgrass	3	2	1
Nezpar Indian ricegrass					Nezpar Indian ricegrass	7		
Luna pubescent wheatgrass					Luna pubescent wheatgrass			
AB-447 crested wheatgrass	5	3	5		AB-447 crested wheatgrass	3	3	2
Goldar bluebunch wheatgrass					Goldar bluebunch wheatgrass		9	
Magnar basin wildrye					Magnar basin wildrye			
Topar pubescent wheatgrass					Topar pubescent wheatgrass			
Secar Snake River wheatgrass	5	4			Secar Snake River wheatgrass	5	3	
Appar blue flax					Appar blue flax			
Firecracker penstemon					Firecracker penstemon			
Bandera Rocky Mt. Penstemon					Bandera Rocky Mt. penstemon			
Palmer's penstemon					Palmer's penstemon			
Alpine penstemon					Alpine penstemon			
Hatch Winterfat	7	7	0	2	AB-555 aster			
AB-764 Winterfat	7	7	9	2	AB-677 aster			
Blackeyed susan					Hatch winterfat			1
AB-922 fourwing saltbush	5		3	6	764 winterfat			2
AB-942 fourwing saltbush	6		0	6	Blackeyed Susan			
Delar small burnet					AB-922 fourwing saltbush			5
Immigrant forage kochia	4	3		5	AB-942 fourwing saltbush			5
Bozoisky Russian wildrye	4	4		2	Delar small burnet			
Vinall Russian wildrye	4	3		2	Immigrant forage kochia			
Lodorm green needlegrass					Ladak alfalfa	6	6	
Blair smooth brome					Buckwheat			
Paute orchardgrass					Arrowleaf balsamroot			

¹ rated on a 1-9 scale (1=best, 9= worst)

Ability to spread was not rated during the 1989 or 1992 evaluations. In 2013, spring seeded Ephraim crested wheatgrass appeared to be spreading via seed into the adjacent plots and beyond. The 2003 evaluation of winterfat and fourwing saltbush are noteworthy in that the reviewer felt one accession of each was able to spread and the other wasn't. In 2013, the two accessions of each shrub were rated identically due to the inability to separate them. At that time, the winterfat had spread more than 30 feet from the original plots. The ability to spread ratings for the spring seeded plots were similar to the fall seeded plots. Crested wheatgrass, Siberian wheatgrass and winterfat all showed high rates of spread.

Gooseberry Creek or Sheep Creek

The Gooseberry Creek demonstration planting site is located approximately 15 miles southeast of Challis (44.281772, -113.970237) at 7,300 ft elevation on Zeelnot gravelly loam soil. The site receives 12 to 16 inches mean annual precipitation. The native plant community is dominated by mountain big sagebrush, Idaho fescue and bluebunch wheatgrass.

Gooseberry Creek stand rating					
	1989 ¹	1992 ¹	2003 ²	2007 ²	2013 ²
Nordan crested wheatgrass	1	6	5	60	50
Bozoisky Russian wildrye	3	4	10	5	
Vinall Russian wildrye	5	6	10	3	
Magnar basin wildrye	9				
Sherman big bluegrass	1	3	95	95	50
Greenar intermediate wheatgrass	8	4	2	2	
P-27 Siberian wheatgrass	1	8	0.5		
Ephraim crested wheatgrass	8	7	3	2	
Paiute orchardgrass					
Appar blue flax	5				1
Cedar Palmer's penstemon	9				
Bandera Rocky Mt. penstemon	8	8			
Durar hard fescue	5	3	85	90	90
Covar sheep fescue	3	3	80	90	80
Manchar smooth brome	3	3	50	50	20
Baylor smooth brome	7	2	20	40	20
Lutana cicer milkvetch		7			
Delar small burnet					
Fairway crested wheatgrass	1	4	5		
RS-2 quackgrass x bluebunch	7				1
RS-1 quackgrass x bluebunch	5				5
BC-70 synthetic alfalfa	7	5			1
GP-52 synthetic alfalfa	5	3			1

¹ rated on a 1-9 scale (1=best, 9= worst)

² rated as percent cover using line intercept method

The Gooseberry Creek site averaged slightly greater precipitation than some of the lower valley sites and thus had better initial establishment of a wide variety of accessions. Over time, the fine fescues, Sherman big bluegrass, and Nordan crested wheatgrass showed the best long term persistence. The fescues in adjacent plots had spread and likely intermingled. There is also an interesting increase in Nordan between 2003 (5%) and 2007 (60%).



Gooseberry Creek demonstration planting site, 2007.

Gooseberry Creek plant density and spread	Density ¹				Spread ²			
	1989	2003	2007	2013	1989	2003	2007	2013
Nordan crested wheatgrass	3.0	0.1	0.6	0.4	5	0	NA	3
Bozoisky Russian wildrye	1.6	0.2	0.1		4	0	NA	
Vinall Russian wildrye	1.2	0.3	0.1		5	0	NA	
Magnar basin wildrye	0.1				9			
Sherman big bluegrass	1.5	1.5	3.0	0.5	5	3	NA	5
Greenar intermediate wheatgrass	0.5	0.5	0.1		5	5		
P-27 Siberian wheatgrass	1.8	0.01			9	0		
Ephraim crested wheatgrass	0.9	0.1	0.1		7	0	NA	
Paiute orchardgrass					0			
Appar blue flax	1.5				3	3		
Cedar Palmer's penstemon	0.1				9			
Bandera Rocky Mt. penstemon	0.2				9			
Durar hard fescue	0.6	2.0	3.0	1.5	7	5	3	2
Covar sheep fescue	1.3	2.0	3.0	1.0	4	5	3	2
Manchar smooth brome		0.5	0.5	0.5	3	2	3	1
Baylor smooth brome		2.5	0.3	0.5	7	3	3	1
Lutana cicer milkvetch								
Delar small burnet								
Fairway crested wheatgrass		0.1			7	0		
RS-2 quackgrass x bluebunch	0.1				7			0
RS-1 quackgrass x bluebunch	0.2			0.5	5			5
BC-70 synthetic alfalfa				0.1	7			3
GP-52 synthetic alfalfa	0.1			0.1	7			3

¹ Plants/ft²

² rated on a 1-9 scale (1=best, 9= worst)

Nordan crested wheatgrass had an excellent density early in the trial (3.0 plants/ft²) but thinned to 0.4 plants/ft² by 2013. Several other accessions also started well and declined or disappeared. Durar hard fescue and Covar sheep fescue maintained high stand densities and percent cover throughout the trial.

The enclosure and surrounding areas are dominated with a fine bunch fescue assumed to be either the native Idaho fescue or sheep fescue. In 2013, it was impossible to measure the spread of the fescue accessions because we could not tell from which direction the plants had come. Sherman big bluegrass had a good stand and had spread approximately 6 ft outside of the plot. Appar blue flax was not observed within its plot but volunteers could be found as much as 15 ft away from the original planting. Smooth brome had spread approximately 60 feet from the original plots into low lying areas.

Round Valley

The Round Valley demonstration planting site is located at an arid site which receives about 6 to 9 inches mean annual precipitation and supports a shadscale and sand dropseed plant community. The site is approximately 2 miles east of Challis (44.487872, -114.124357) at an elevation of 5,200 ft on Snowslide very gravelly loam soil.

Fifteen of 24 accessions were established at the time of the 1985 evaluation. In 2013, however, only 5 accessions, Immigrant forage kochia, P-27 Siberian wheatgrass, Nordan crested wheatgrass and both Russian wildrye accessions, had persisted. Much of the site at the time of the 2013 evaluation was dominated by P-27 Siberian wheatgrass. Presumably this was the result of a seeding outside of the Round Valley enclosure.



Round Valley demonstration planting site, 2007.

Round Valley stand rating							
	1985 ¹	1992 ¹	1995 ¹	1999 ¹	2003 ²	2007 ²	2013 ²
GP-52 Synthetic alfalfa	6	9					
BC-79 Synthetic alfalfa	3						
RS-1 bluebunch x quackgrass		9		9	1		
RS-2 bluebunch x quackgrass		8		8	1		
Fairway crested wheatgrass	7	9		9			
Immigrant forage kochia		7	7	7	2	1	1
Scarlet globemallow		9			1		
Bandera Rocky Mt. penstemon							
Cedar Palmer's penstemon							
Appar blue flax	2						
Paiute orchardgrass	9						
Ephraim crested wheatgrass	5	8	3	7	70	35	
P-27 Siberian wheatgrass	6	3	3	3	70	70	70
Goldar bluebunch wheatgrass	4		8				
Secar Snake River wheatgrass	3	5	7	8			
Barton western wheatgrass							
Topar pubescent wheatgrass	7						
Whitmar beardless wheatgrass	7						
Nezpar Indian ricegrass	8				1		
Magnar basin wildrye	7		7				
Vinall Russian wildrye		2	2	2	30	75	40
Bozoisky Russian wildrye	7	1	1	1	75	90	80
Yellow sweetclover							
Nordan crested wheatgrass	6	1	2	1	60	65	1

¹ rated on a 1-9 scale (1=best, 9= worst)

² rated as percent cover using line intercept method

Plant densities in general decreased over time for all species and accessions with the exception of P-27 Siberian wheatgrass and the two Russian wildrye accessions which maintained at nearly 1 plant/ft² over the course of the study. Nordan crested wheatgrass interestingly peaked at 2 plants/ft² in 1999 then steadily declined to only 0.01 plants/ft² in 2013, likely being replaced by the more drought tolerant accessions of Siberian wheatgrass and Russian wildrye.



Round Valley. Original drill rows are clearly visible in some accessions.

Round Valley plant density¹						
	1989	1995	1999	2003	2007	2013
GP-52 Synthetic alfalfa	0.1					
BC-79 Synthetic alfalfa	0.2					
RS-1 bluebunch x quackgrass	0.4		0.5	0.01		
RS-2 bluebunch x quackgrass			0.5	0.01		
Fairway crested wheatgrass			0.5			
Immigrant forage kochia		1.0	0.5	0.1	0.1	0.01
Scarlet globemallow				0.1		
Bandera Rocky Mt. penstemon						
Cedar Palmer's penstemon						
Appar blue flax						
Paiute orchardgrass						
Ephraim crested wheatgrass	0.7	0.75	0.5	1.0	0.5	
P-27 Siberian wheatgrass	0.7	1.0	1.5	1.0	0.75	0.7
Goldal bluebunch wheatgrass	0.3	0.25				
Secar Snake River wheatgrass	1.0	0.05	0.5			
Barton western wheatgrass						
Topar pubescent wheatgrass	1.2					
Whitmar beardless wheatgrass	0.8					
Nezpar Indian ricegrass						
Magnar basin wildrye		0.1				
Vinall Russian wildrye	0.1	0.8	1.0	0.5	1.0	0.5
Bozoisky Russian wildrye	0.6	1.25	3.0	1.5	1.5	1.0
Yellow sweetclover						
Nordan crested wheatgrass	1.0	0.9	2.0	1.0	0.6	0.01

¹ Plants/ft²

Due to the use of P-27 Siberian wheatgrass outside the enclosure it was difficult to measure the spread of P-27 Siberian wheatgrass from the original plots. After 30 years, the rows of Bozoisky Russian wildrye were still easy to locate and showed little encroachment from weeds. Russian wildrye had spread approximately 12 ft beyond the original plots by 2013. Immigrant forage kochia had spread approximately 7 ft beyond the original plots by the final evaluation despite very low density within the plots.

Round Valley ability to spread ¹						
	1989	1995	1999	2003	2007	2013
GP-52 Synthetic alfalfa						
BC-79 Synthetic alfalfa						
RS-1 bluebunch x quackgrass			9			
RS-2 bluebunch x quackgrass			8			
Fairway crested wheatgrass			8			
Immigrant forage kochia		5	5	3	3	3
Scarlet globemallow						
Bandera Rocky Mt. penstemon						
Cedar Palmer's penstemon						
Appar blue flax						
Paiute orchardgrass						
Ephraim crested wheatgrass		3	7		NA	
P-27 Siberian wheatgrass		3	2		NA	3
Goldar bluebunch wheatgrass		5				
Secar Snake River wheatgrass			9			
Barton western wheatgrass						
Topar pubescent wheatgrass						
Whitmar beardless wheatgrass						
Nezpar Indian ricegrass						
Magnar basin wildrye		7				
Vinall Russian wildrye		3	5		NA	4
Bozoisky Russian wildrye		3	7		NA	4
Yellow sweetclover						
Nordan crested wheatgrass		2	3		NA	

¹ rated on a 1-9 scale (1=best, 9= worst)

Conclusions

In general, introduced species such as crested wheatgrass, Siberian wheatgrass, Russian wildrye and forage kochia showed good to excellent establishment and persistence at sites with lower average precipitation (6-11 in). However at the Bradbury Flat site, native accessions Sodar streambank wheatgrass and two accessions of winterfat also performed well. The two higher precipitation sites (12-16 in), Jeff's Flat and Gooseberry Creek, favored long-term establishment of fine fescues over all other species. Crested wheatgrass, Russian wildrye and Whitmar beardless wheatgrass were the top long-term performers at Centennial Flat, which is intermediate in precipitation (8-12 in).

The ability of Russian wildrye plants to exclude new plants from establishing between the rows is worth noting. Russian wildrye has been found to be an effective species for green stripping (fuel breaks) due to its ability to remain green throughout a longer portion of the growing season than other species, and for its ability to halt the spread of invasive annual grasses that create flash-fuel for wildfires. This study has shown that Russian wildrye can maintain clean between-row spaces with little encroachment from high risk species for over 30 years.

Many species and accessions tested in the trial either failed to establish, or established but did not persist. The low precipitation sites were especially difficult. Forbs had poor establishment at most locations. At Centennial Flat the only forbs to establish and persist to 2013 were alfalfa,

Lutana cicer milkvetch and scarlet globemallow. Alfalfa and yellow sweetclover established and persisted at low densities at Jeff's Flat until the 2007 evaluation. At Gooseberry Creek, Appar blue flax and both accessions of alfalfa had managed to maintain at very low levels (1% stand) in 2013. No forbs persisted at Round Valley or the Spud Alluvial site through 2013.

Based on these findings, introduced species are safe recommendations for range seedings in the Challis, Idaho area on sites receiving less than 12 inches mean annual precipitation. There is however some risk of introduced species spreading under exceptional precipitation periods. On low precipitation sites where native plant communities are desirable, streambank wheatgrass and winterfat are viable options. On higher precipitation sites, many additional native species should be considered.

Rangeland grasses are susceptible to reduction in plant vigor due to old plant residue (litter) buildup in the crowns in the absence of grazing or other disturbance. Without periodic mechanical harvest or proper grazing management, plant litter increases over time and shades the photosynthetically active plant material, reducing ability of the plant to capture sunlight necessary for growth. Stands should be periodically grazed, mowed, burned or otherwise managed to break down old plant residue or litter to help maintain plant health. See Idaho Plant Materials Technical Notes 10 and 11 for more information on range management.

Several new plant cultivars (varieties) that have potential for use in the Challis region have been released since the beginning of this trial. Bozoisky II Russian wildrye was selected for improved seedling vigor (emergence from deeper planting depth), seed yield, vegetative vigor, total dry matter production, and response to drought. Bozoisky II Russian wildrye also has a much broader genetic base than other Russian wildrye cultivars and was extensively evaluated on rangeland sites in the western United States. Vavilov Siberian wheatgrass was released for its significantly improved seedling vigor compared to P-27; and Vavilov II Siberian wheatgrass' improved ability to resist wear and trampling. Because Vavilov and Vavilov II Siberian wheatgrass are tremendous improvements in seedling vigor and trampling resistance, P-27 Siberian wheatgrass was discontinued in 2010. Anatone bluebunch wheatgrass, a recent release of bluebunch wheatgrass has improved seedling vigor allowing it to establish at lower precipitation areas than Goldar bluebunch wheatgrass or Whitmar beardless wheatgrass. Additional new and improved plant releases that should be considered for use in the Challis area include Bannock thickspike wheatgrass, High Plains Sandberg bluegrass, Discovery Snake River wheatgrass, and selections of bottlebrush squirreltail.