United States Department of Agriculture
NATURAL RESOURCES CONSERVATION SERVICE
Forestry Technical Note No. MT-27
April 2006

FORESTRY TECHNICAL NOTE

Performance Evaluations of Herbaceous Vegetation on Disturbed Forestland in Southeastern Montana

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Summary

Information for seeding herbaceous vegetation following forestland disturbance was identified as a conservation need in southeastern Montana. The herbaceous vegetation could be used to control soil erosion, stabilize disturbed sites, manage noxious weeds and provide forage. The Fulton Ranch field evaluation planting (FEP) was established in November 1995 on a disturbed forestland site in southeastern Montana to study the adaptation, performance and use of various grass species. The site, a Ponderosa pine/Idaho fescue habitat-type, had received a light to moderate burn from a wildfire that occurred in August 1994 and was logged the following spring. Nineteen evaluation plots were established to test seventeen different accessions of grasses; two control (unseeded) plots were established. Each plot was one-quarter of an acre in size. Seeded species included 'Sherman' big bluegrass, 'Latar' orchardgrass, 'Paiute' orchardgrass, 'Manska' pubescent wheatgrass, 'Oahe' intermediate wheatgrass, 'Rush' intermediate wheatgrass, 'Dacotah' switchgrass, 'Forestberg' switchgrass, 9005308 mountain brome, 'Regar' meadow brome, 'Redondo' Arizona fescue, 'Whitmar' beardless wheatgrass, 'Goldar' bluebunch wheatgrass, M-1 Nevada bluegrass, 'Killdeer' sideoats grama, 'Pierre' sideoats grama, and 'Pryor' slender wheatgrass. An evaluation of several species for seeding road systems was also conducted as part of this FEP. Road surface, cut and fill slopes were seeded with 'Luna' pubescent wheatgrass, 'Covar' sheep fescue, 'Durar' hard fescue, 'Critana' thickspike wheatgrass, 'Sodar' streambank wheatgrass, and 'Rosana' western wheatgrass. All plots were monitored for plant adaptation, percent canopy cover (seeded), forage production and tree seedling regeneration over ten years, Tables 1 – 8.

The results showed that the top four performers in stand establishment, plant vigor, forage production and percent canopy cover were: Rush intermediate wheatgrass, Manska pubescent wheatgrass, Oahe intermediate wheatgrass and Paiute orchardgrass, Tables 1 – 5. The top three performers for seeding in road systems based on stand establishment and plant vigor were: Covar sheep fescue, Luna pubescent wheatgrass and Rosana western wheatgrass, Tables 7 – 8.

There was a slight reduction in the number of ponderosa pine seedling regenerating in the overall seeded plots versus the control (unseeded) plots. Of

special note is that the tree seedling numbers were greater for the most successful group (Paiute, Manska, Oahe, Rush) than for the other seeded species group, Table 6.

The results from this observational trial showed that a variety of grasses can be successfully established and manage in southeastern Montana forestlands. Producers will be able to make more informed decisions about what herbaceous species to seed on disturbed forestland sites based on their management goals and objectives.

Attached are various tables that show the results from the data that was collected over the ten year period.

Recommendations

- The top four cultivars in terms of stand establishment, plant vigor, forage production and percent canopy cover were: Rush intermediate wheatgrass, Manska pubescent wheatgrass, Oahe intermediate wheatgrass and Paiute orchardgrass. However, at the last monitoring period cover and production of Paiute had declined from previous years.

- Forage production was significantly greater (1.5 to almost 2 times) in the top four cultivars when compared to the natural control plots.

- Dormant fall seeding following a disturbance provides the best seedbed conditions for seed/soil contact.

- The most successful cultivars were valuable in reducing erosion, particularly in the year immediately after disturbance.

- The top three cultivars for seeding in road systems based on stand establishment and plant vigor were: Covar sheep fescue, Luna pubescent wheatgrass and Rosana western wheatgrass.

- Ponderosa pine seedling regeneration was slightly reduced in the overall seeded plots versus the control (unseeded) plots. Tree seedling numbers were greater for the most successful group (Paiute, Manska, Oahe, Rush) than for the other seeded species group.

- The amount of site scarification had a direct effect on some of the species ability to establish. Not all sites received the same amount of site scarification. The lightly burned and/or non-scarified areas did not remove enough of the litter and duff layer to expose mineral soil and prepare an adequate seed bed.

- Don't base stand establishment off first year evaluation. Many of the species are slow to establish on non-irrigated sites.

Where to get help

For more information, contact the local office of the USDA Natural Resources Conservation Service or your local Soil and Water Conservation District.

Table 1 - Fulton Field Evaluation Planting (FEP) 1996-2005								
Accession	Species	Stand[1]						
	Scientific and Common Name	1996	1997	1998	2000	2002	2005	mean
Sherman	Poa ampla----------Big bluegrass	7.5	4.0	4.0	2.0	2.0	3.0	3.9
Latar	Dactylis glomerata----------Orchardgrass	9.0	3.0	4.0	3.0	7.0	8.0	5.2
Paiute	Dactylis glomerata----------Orchardgrass	5.0	2.0	2.0	1.0	5.0	7.0	3.0
Manska	Agropyron trichophorum---Pubescent wheatgrass	2.5	2.0	2.0	1.0	1.0	1.0	1.7
Oahe	Agropyron intermedium---Intermediate wheatgrass	5.0	2.0	2.0	2.0	2.0	1.0	2.6
Rush	Agropyron intermedium---Intermediate wheatgrass	5.0	1.0	1.0	1.0	1.0	1.0	1.8
Dacotah	Panicum virgatum----------Switchgrass	7.5	9.0	9.0	7.0	7.0	8.0	7.9
Forestberg	Panicum virgatum----------Switchgrass	7.5	9.0	9.0	9.0	9.0	9.0	8.7
9005308	Bromus marginatus----------Mountain brome	7.5	7.0	5.0	9.0	9.0	9.0	7.5
Regar	Bromus biebersteinii----------Meadow brome	9.0	3.0	3.0	2.0	3.0	5.0	4.0
Redondo	Festuca arizonica----------Arizona fescue	7.5	4.0	4.0	4.0	4.0	4.0	4.7
Whitmar	Agropyron spicatum----------Beardless wheatgrass	7.5	3.0	5.0	3.0	3.0	1.0	4.3
Goldar	Agropyron spicatum----------Bluebunch wheatgrass	5.0	5.0	5.0	6.0	3.0	2.0	4.8
M-1	Poa nevadensis----------Nevada bluegrass	2.5	7.0	8.0	8.0	8.0	9.0	6.7
Killdeer	Bouteloua curtipendula----------Sideoats grama	5.0	7.0	7.0	8.5	8.0	8.0	7.1
Pierre	Bouteloua curtipendula----------Sideoats grama	4.0	7.0	6.0	7.0	9.0	7.0	6.6
Pryor	Agropyron trachycaulum-------Slender wheatgrass	7.5	8.0	9.0	4.5	9.0	8.0	7.6

[1]1 = excellent, 9 = very poor

Table 2 - Fulton Field Evaluation Planting (FEP) 1996-2005								
Accession	Species	Vigor[1]						
	Scientific and Common Name	1996*	1997	1998	2000**	2002	2005	mean
Sherman	Poa ampla----------Big bluegrass		3.0	2.0		3.0	4.0	2.7
Latar	Dactylis glomerata----------Orchardgrass		3.0	2.0		5.0	5.0	3.3
Paiute	Dactylis glomerata----------Orchardgrass		2.0	3.0		5.0	5.0	3.3
Manska	Agropyron trichophorum-----Pubescent wheatgrass		2.0	2.0		1.0	4.0	1.7
Oahe	Agropyron intermedium----Intermediate wheatgrass		2.0	3.0		2.0	4.0	2.3
Rush	Agropyron intermedium----Intermediate wheatgrass		1.0	1.0		1.0	3.0	1.0
Dacotah	Panicum virgatum----------Switchgrass		5.0	2.0		3.0	3.0	3.3
Forestberg	Panicum virgatum----------Switchgrass		5.0	9.0		5.0	3.0	6.3
9005308	Bromus marginatus----------Mountain brome		5.0	6.0		7.0	7.0	6.0
Regar	Bromus biebersteinii----------Meadow brome		3.0	3.0		5.0	4.0	3.7
Redondo	Festuca arizonica----------Arizona fescue		3.0	3.0		5.0	3.0	3.7
Whitmar	Agropyron spicatum----------Beardless wheatgrass		3.0	6.0		4.0	3.0	4.3
Goldar	Agropyron spicatum----------Bluebunch wheatgrass		3.0	5.0		3.0	2.0	3.7
M-1	Poa nevadensis----------Nevada bluegrass		5.0	5.0		5.0	5.0	5.0
Killdeer	Bouteloua curtipendula----------Sideoats grama		5.0	4.0		6.0	5.0	5.0
Pierre	Bouteloua curtipendula----------Sideoats grama		5.0	3.0		5.0	4.0	4.3
Pryor	Agropyron trachycaulum-----Slender wheatgrass		5.0	5.0		7.0	5.0	5.7

[1]1 = excellent, 9 = very poor

*vigor was not rated this 1st year

**heavy livestock use prevented vigor rating for this year

Table 3 - Fulton Field Evaluation Planting (FEP) 1996-2005						
Accession	Species	Yield lbs/acre²				
	Scientific and Common Name	1997	1998	2002	2005	mean
Sherman	Poa ampla----------Big bluegrass	840.0	968.0	587.0	890.0	821.3
Latar	Dactylis glomerata----------Orchardgrass	744.0	1388.0	347.0	913.0	848.0
Paiute	Dactylis glomerata----------Orchardgrass	1082.0	2250.0	677.0	670.0	1169.8
Manska	Agropyron trichophorum----Pubescent wheatgrass	1599.0	1502.0	790.0	987.0	1219.5
Oahe	Agropyron intermedium---Intermediate wheatgrass	1211.0	1356.0	1230.0	1050.0	1211.8
Rush	Agropyron intermedium---Intermediate wheatgrass	1903.0	1285.0	1427.0	2470.0	1771.3
Dacotah	Panicum virgatum----------Switchgrass	0.0	0.0	0.0	0.0	0.0
Forestberg	Panicum virgatum----------Switchgrass	0.0	0.0	0.0	0.0	0.0
9005308	Bromus marginatus----------Mountain brome	0.0	0.0	0.0	0.0	0.0
Regar	Bromus biebersteinii----------Meadow brome	1090.0	1304.0	473.0	857.0	931.0
Redondo	Festuca arizonica----------Arizona fescue	987.0	671.0	510.0	440.0	652.0
Whitmar	Agropyron spicatum--------Beardless wheatgrass	735.0	533.0	566.0	703.0	634.3
Goldar	Agropyron spicatum--------Bluebunch wheatgrass	630.0	786.0	610.0	1450.0	869.0
M-1	Poa nevadensis----------Nevada bluegrass				1293.0	1293.0
Killdeer	Bouteloua curtipendula----------Sideoats grama				850.0	850.0
Pierre	Bouteloua curtipendula----------Sideoats grama				860.0	860.0
Pryor	Agropyron trachycaulum-------Slender wheatgrass	0.0	0.0	0.0	0.0	0.0
	Control J - K	480.0	900.0	593.0	857.0	707.5
	Control N - O	810.0	1225.0	630.0	897.0	890.5

²mean of 3 - 9.6 ft² round plots

Table 4 - Fulton Field Evaluation Planting (FEP) 1996-2005						
Accession	Species	Yield kg/Ha				
	Scientific and Common Name	1997	1998	2002	2005	mean
Sherman	Poa ampla----------Big bluegrass	941.0	1084.0	657.0	997.0	919.8
Latar	Dactylis glomerata---------Orchardgrass	833.0	1555.0	389.0	1023.0	950.0
Paiute	Dactylis glomerata---------Orchardgrass	1212.0	2520.0	758.0	750.0	1310.0
Manska	Agropyron trichophorum-----Pubescent wheatgrass	1791.0	1682.0	885.0	1105.0	1365.8
Oahe	Agropyron intermedium----Intermediate wheatgrass	1356.0	1519.0	1378.0	1176.0	1357.3
Rush	Agropyron intermedium----Intermediate wheatgrass	2131.0	1439.0	1598.0	2766.0	1983.5
Dacotah	Panicum virgatum----------Switchgrass	0.0	0.0	0.0	0.0	0.0
Forestberg	Panicum virgatum----------Switchgrass	0.0	0.0	0.0	0.0	0.0
9005308	Bromus marginatus----------Mountain brome	0.0	0.0	0.0	0.0	0.0
Regar	Bromus biebersteinii----------Meadow brome	1221.0	1460.0	530.0	960.0	1042.8
Redondo	Festuca arizonica----------Arizona fescue	1105.0	752.0	571.0	493.0	730.3
Whitmar	Agropyron spicatum---------Beardless wheatgrass	823.0	597.0	634.0	787.0	710.3
Goldar	Agropyron spicatum---------Bluebunch wheatgrass	706.0	880.0	683.0	1624.0	973.3
M-1	Poa nevadensis----------Nevada bluegrass				1448.0	1448.0
Killdeer	Bouteloua curtipendula---------Sideoats grama				952.0	952.0
Pierre	Bouteloua curtipendula---------Sideoats grama				963.0	963.0
Pryor	Agropyron trachycaulum ------Slender wheatgrass	0.0	0.0	0.0	0.0	0.0
	Control J - K	538.0	1008.0	664.0	960.0	792.5
	Control N - O	907.0	1372.0	706.0	1005.0	997.5

Table 5 - Fulton Field Evaluation Planting (FEP) 1996-2005								
Accession	Species	% Canopy Cover (Seeded)[3]						
	Scientific and Common Name	1996	1997	1998	2000	2002	2005	mean
Sherman	Poa ampla----------Big bluegrass		2.0	2.0	2.0	8.0	17.0	6.2
Latar	Dactylis glomerata---------Orchardgrass		6.0	6.0	2.0	4.0	13.0	6.2
Paiute	Dactylis glomerata---------Orchardgrass	13.0	21.0	11.0	6.0	10.0	17.0	13.0
Manska	Agropyron trichophorum--------Pubescent wheatgrass	19.0	9.0	4.0	3.0	20.0	17.0	12.0
Oahe	Agropyron intermedium-----Intermediate wheatgrass	9.0	10.0	8.0	14.0	30.0	30.0	16.8
Rush	Agropyron intermedium-----Intermediate wheatgrass	8.0	6.0	7.0	16.0	30.0	17.0	14.0
Dacotah	Panicum virgatum----------Switchgrass	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Forestberg	Panicum virgatum----------Switchgrass	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9005308	Bromus marginatus----------Mountain brome	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Regar	Bromus biebersteinii----------Meadow brome		8.0	7.0	10.0	17.0	20.0	12.4
Redondo	Festuca arizonica----------Arizona fescue		2.0	5.0	6.0	11.0	11.0	7.0
Whitmar	Agropyron spicatum----------Beardless wheatgrass		5.0	4.0	3.0	10.0	30.0	10.4
Goldar	Agropyron spicatum----------Bluebunch wheatgrass	5.0	3.0	3.0	4.0	18.0	11.0	7.3
M-1	Poa nevadensis----------Nevada bluegrass	14.0	4.0	2.0	1.0	1.0	1.0	3.8
Killdeer	Bouteloua curtipendula----------Sideoats grama	4.0		3.0	3.0	2.0	6.0	3.6
Pierre	Bouteloua curtipendula----------Sideoats grama	6.0	1.0	3.0	3.0	2.0	13.0	4.7
Pryor	Agropyron trachycaulum----------Slender wheatgrass	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Control J - K		5.0	10.0	6.0	11.0	10.0	8.4
	Control N - O	8.0		5.0	5.0	9.0	8.0	7.0

[3]determined with Daubinmire quadrant frame method

Table 6 - Fulton Field Evaluation Planting (FEP) 1996-2005								
Accession	Species	Tree Seedlings per Acre[4]						
	Scientific and Common Name	1996	1997	1998	2000	2002	2005	mean
Sherman	Poa ampla----------Big bluegrass			300.0	470.0	468.0	429.0	416.8
Latar	Dactylis glomerata----------Orchardgrass			100.0	220.0	143.0	143.0	151.5
Paiute	Dactylis glomerata----------Orchardgrass			200.0	100.0	104.0	91.0	123.8
Manska	Agropyron trichophorum-----Pubescent wheatgrass			400.0	250.0	221.0	234.0	276.3
Oahe	Agropyron intermedium-----Intermediate wheatgrass			400.0	570.0	546.0	650.0	541.5
Rush	Agropyron intermedium-----Intermediate wheatgrass			100.0	250.0	273.0	286.0	227.3
Dacotah	Panicum virgatum----------Switchgrass			0.0	0.0	0.0	0.0	0.0
Forestberg	Panicum virgatum----------Switchgrass			0.0	0.0	0.0	0.0	0.0
9005308	Bromus marginatus----------Mountain brome			0.0	0.0	0.0	0.0	0.0
Regar	Bromus biebersteinii----------Meadow brome			100.0	200.0	156.0	143.0	149.8
Redondo	Festuca arizonica----------Arizona fescue			300.0	460.0	286.0	377.0	355.8
Whitmar	Agropyron spicatum----------Beardless wheatgrass			0.0	510.0	312.0	221.0	260.8
Goldar	Agropyron spicatum----------Bluebunch wheatgrass			0.0	350.0	273.0	338.0	240.3
M-1	Poa nevadensis----------Nevada bluegrass			0.0	60.0	52.0	52.0	41.0
Killdeer	Bouteloua curtipendula---------Sideoats grama			0.0	60.0	39.0	78.0	44.3
Pierre	Bouteloua curtipendula---------Sideoats grama			0.0	20.0	13.0	0.0	8.3
Pryor	Agropyron trachycaulum----------Slender wheatgrass			0.0	0.0	0.0	0.0	0.0
	Control J - K			200.0	600.0	585.0	546.0	482.8
	Control N - O			0.0	90.0	52.0	52.0	48.5

[4]66 feet diameter sample size

Table 7 - Fulton Field Evaluation Planting (FEP) 1996-2005										
	Ratings for Road System Segments									
						Stand[1]				
Accession	Species		1997			1998			2005	
	Scientific and Common Name	Cut Slope	Surface	Fill Slope	Cut Slope	Surface	Fill Slope	Cut Slope	Surface	Fill Slope
Luna	Agropyron trichophorum-------Pubescent wheatgrass	7.0	2.0	4.0	3.0	3.0	3.0	1.0	1.0	1.0
Covar	Festuca ovina----------Sheep fescue	5.0	3.0	6.0	3.0	3.0	2.0	1.0	1.0	1.0
Durar	Festuca ovina cv. Durar-------Hard fescue	8.0	8.0	8.0	9.0	9.0	9.0	7.0	7.0	7.0
Critana	Agropyron dasystachyum----Thickspike wheatgrass	6.0	2.0	7.0	5.0	7.0	6.0	5.0	5.0	5.0
Sodar	Agropyron riparium----------Streambank wheatgrass	7.0	3.0	4.0	7.0	8.0	5.0	3.0	3.0	3.0
Rosana	Agropyron smithii----------Western wheatgrass	6.0	5.0	5.0	7.0	3.0	5.0	1.0	1.0	1.0

[1]1 = excellent, 9 = very poor

Table 8 - Fulton Field Evaluation Planting (FEP) 1996-2005										
	Ratings for Road System Segments									
						Vigor[1]				
Accession	Species		1997			1998			2005	
	Scientific and Common Name	Cut Slope	Surface	Fill Slope	Cut Slope	Surface	Fill Slope	Cut Slope	Surface	Fill Slope
Luna	Agropyron trichophorum-----Pubescent wheatgrass	5.0	1.0	3.0	5.0	5.0	5.0	1.0	1.0	1.0
Covar	Festuca ovina----------Sheep fescue	3.0	3.0	3.0	3.0	3.0	2.0	1.0	1.0	1.0
Durar	Festuca ovina cv. Durar------Hard fescue	4.0	4.0	4.0	5.0	5.0	9.0	3.0	3.0	3.0
Critana	Agropyron dasystachyum---Thickspike wheatgrass	4.0	2.0	4.0	6.0	7.0	4.0	3.0	3.0	3.0
Sodar	Agropyron riparium----------Streambank wheatgrass	4.0	3.0	3.0	7.0	9.0	5.0	3.0	3.0	3.0
Rosana	Agropyron smithii----------Western wheatgrass	4.0	3.0	3.0	3.0	3.0	3.0	1.0	1.0	1.0

[1]1 = excellent, 9 = very poor