

## DESIGN AND INSTALLATION GUIDE

### Pasture and Hay Planting – 512

Pasture and Hay Planting shall be planned and applied in accordance with the standard detailed in Field Office Technical Guide (FOTG), Section IV, Conservation Practices, Pasture and Hay Planting – 512 subfolder. This document provides conservation planners with additional parameters, recommendations, references, and requirements for developing site-specific plans for this practice.

**1. Refer to Herbaceous Vegetation Establishment Guide (FOTG, Section I- Reference Subjects- Plant Materials Subsection) for:**

- Seeding dates (Part 1)
- Seedbed preparation (Part 2)
- Seeding equipment (Part 3)
- Drill calibration (Part 4)
- Seed requirements (Part 5)
- Seeding depth (Part 6)
- Cover and companion crops (Part 7)
- Management and protection during establishment (Part 8)
- Procedure for stand evaluation (Part 9)

**2. Selecting Species and Varieties**

- a. Determine the Pasture, Hay, or Forage Suitability Group based on soils, from Section II, Soils Information subsection of the Field Office Technical Guide.
- b. Refer to Table 1 or Forage Suitability Groups (FSG), if available, for Species Suitability of this specification for selecting species and developing mixtures for the appropriate Pasture and Hay Suitability Group. Preferred species, indicated with the letter (G), will produce up to their genetic potential. Other suitable species indicated with the letter (F), are adapted but will not produce at their highest potential. A dash (-) indicates that the species is unsuited and shall not be recommended.
- c. Refer to Herbaceous Vegetation Establishment Guide for best-adapted varieties and full seeding rates of grasses, forbs and legumes. Use named varieties when available.
- d. Refer to Table 1 of this specification for mixture compatibility and allowable limits.

### 3. Planning Considerations

- a. Species planned for pasture or hayland should be compatible with the planned management of the entire operating unit. Select species that provide good forage for grazing or hay as appropriate. Consider all existing forages available on the operation when selecting the types of forages to be planted. Identify windows of time throughout the grazing or haying season when forage is lacking in quantity and quality. Next select species that are of high quality during the deficient period.
- b. For ease of management, mixtures should consist of grass, forb and/or legume species having similar growth habits, similar palatability during the intended period of use, and similar seasons of growth. Refer to Herbaceous Vegetation Establishment Guide for species characteristics table.
- c. Caution should be used when mixing warm and cool-season species for pasture use. Warm/cool season mixtures should not be used for hayland. Growth periods and maturity are different, which causes difficulty with management of stands. Consider using Practice 550, Range Planting, for designing mixtures for a pasture that will be grazed during various periods throughout the growing season.
- d. Grass stand longevity and productivity can generally be improved with perennial legumes in the pasture and hayland mixture. As level of management increases on pasture, seeding mixture diversity may be increased. Consult NRCS area or state specialist for guidance in these situations.
- e. Pasture-type alfalfas should be used in pasture mixtures, since this type of alfalfa shows better survivability under grazing use. The land user should be aware of bloat hazard when legumes are included in pasture mixtures. There have been no cases of bloat reported when grazing stands of Cicer milkvetch and/or sainfoin.
- f. Where water erosion is a concern all operations and seeding should be performed across the general slope of the fields where appropriate.
- g. For improved germination, scarification of legumes with hard seed coats is recommended. Scarification is especially important with the following species: Cicer milkvetch, purple prairie clover, white prairie clover, leadplant, birdsfoot trefoil and Canada milkvetch.
- h. The landuser should be aware of potential toxicity to horses, sheep and goats when they are allowed to graze pure stands of switchgrass.
- i. Sodic-saline soils and saline soils should only be seeded into standing or flat residues and as a dormant seeding for cool-season species. Mulching is recommended for improved stand establishment on sodic-saline and saline soils when planting both cool-season and warm-season species.
- j. Slender wheatgrass, Dahurian and Canada wildrye are short-lived species, but establish rapidly and provide quick cover.
- k. Fertilization is not recommended during the establishment phase. Fertilization during the establishment phase tends to favor annual weeds over perennial forage species. For recommendations on management of established stands, refer to Forage Harvest Management in FOTG Section IV.
- l. On slopes greater than 9%, a minimum of 50% of the mixture must be rhizomatous grass species.

#### 4. Pasture and Hay Renovation

Pasture and hay renovation has limited application in the state. Usually, a complete seedbed preparation and seeding operation is recommended. Exceptions to this are:

- a. On soils with high erosion potential where the stand composition and/or vigor have deteriorated and a complete re-establishment is required: Areas where wind erosion is the concern, re-establishment should be done in narrow strips. Where water erosion is the concern, re-establishment should be done in narrow strips on the contour.
- b. Pasture or hayland that is low in vigor and production: fertilization and/or a light mechanical disturbance of the soil surface may improve these areas. For information on type, rate, and time of fertilizer application, uses recommendations by North Dakota State University, Cooperative Extension Service <http://www.ext.nodak.edu/extpubs/soilfert.htm> (Circulars SF-721 and SF-728).
- c. Interseeding adapted native and/or introduced legumes into existing introduced pasture or hayland (not applicable to rangeland or native grassland) on which the desirable legume/forb species were never established, have diminished, or disappeared from the stand has had limited success within the state. Benefits of successfully establishing legumes/forbs into an existing grass stand would include improvements to soil health, increased forage production, enhanced diet quality and improved wildlife habitat. Interseeding the same or different grass species into existing grass stands has not proven successful.

On-site investigation to determine feasibility of interseeding is required. Timing of precipitation, soils, soil moisture at time of seeding, species selection, seedling vigor, seeding technique, and the amount of competition from established species are all factors affecting the level of success. Vigor and density of the existing stand will impact available moisture for new seedlings. Soil surface conditions, including amount of bare soil surface, litter amounts (thickness and extent), and presence of a root mat (most common with Kentucky bluegrass), will directly affect the ability to obtain good seed/soil contact.

Interseeding may be considered if the Pasture Condition Score Sheet (ND-CPA-32) shows an overall score of less than 36 OR an indicator rating of three or less for Live Plant Cover and a rating of two or less for Plant Residue and Plant Vigor. In addition, plant litter amounts will be minimal with no root mat or club moss present.

Species adaptation information for native legumes can be found on Table 1 in the Range Planting Design and Installation Guide (practice code 550). Suitability information for introduced legumes can be found in the Pasture and Hay Planting Design and Installation Guide (practice code 512). Seeding rates for adapted legume/forbs should be one-half the recommended full seeding rate for the species. If multiple legume/forb species are being interseeded, then the total seeding rate for all species should not exceed 50%. Full seeding rates are shown in Table 1 of the Herbaceous Vegetation Establishment Guide (HVEG), located in FOTG-Section I-Reference Subjects-Plant Materials.

Site preparation and seeding technique will be a site specific determination. To reduce competition to seedlings, smooth bromegrass stands may need to be suppressed with an application of Glyphosate as per label directions. Other techniques such as heavy harrowing when plant litter is very dry (days with extremely low relative humidity) may reduce litter cover and help ensure seed to soil contact. Seeding equipment will need

to penetrate the soil surface and place the seed at the proper depth. Seeding dates will follow the recommendations in the HVEG for the spring and late fall (dormant) seeding periods. The late summer seeding period is not recommended due to moisture limitations. Grazing will be deferred for at least one growing season to allow for seedling establishment. Dormant season grazing may be permissible on a case-by-case basis.

**5. Guidelines for stand evaluation**

- a. Stands for forage production must have a minimum density of two rhizomatous grass plants per square foot, or four plants per square foot for bunchgrasses or mixtures of bunch and rhizomatous type grasses; or in the case of grass-legume mixtures, two grass plants and two legume plants per square foot.
- b. See Part 9 of Herbaceous Vegetation Establishment Guide for additional guidance on stand evaluation.

**6. Established stand management**

- a. Refer to Practice 528, Prescribed Grazing, for management of established pasture plantings
- b. Refer to Practice 511, Forage Harvest Management, for management of established hayland plantings.

**7. Documentation**

- a. Use ND-CPA-9 (electronic or hardcopy) to document practice planning and installation. This form is located on the ND forms site at <ftp://ftp-fc.sc.egov.usda.gov/ND/forms/>

<b>Table 1. MIXTURE COMPATABILITY AND ALLOWABLE LIMITS</b>				
<b>Species</b>	<b>Mixture Compatability<sup>1</sup></b>	<b>Mixture % Min.- Max.<sup>2</sup></b>	<b>Growth Characteristics<sup>3</sup></b>	<b>Best Use<sup>8</sup></b>
<b>Introduced Cool-Season Grasses</b>				
Bromegrass				
Meadow	D,H	30-100	B/M	Both
Smooth	C,D	30-100	R/M	Both
Creeping foxtail	F	50-100	R/M	Both
Hard fescue	A,B,C,D	0-20	B/S	Pasture
Timothy <sup>4</sup>	C,D,H	10-50	B/M	Both
Wheatgrass				
"NewHy" hybrid wheatgrass	A,B,C,D,J	30-100	B/M	Both
Crested	B	30-100	B/M	Both
Intermediate	A,B,C,D,H	30-100	R/M	Both
Pubescent	A,B,C,D,H	30-100	R/M	Both
Siberian	B	30-100	R/M	Pasture
Tall	J	30-100	B/T	Hay
Wildrye				
Altai	E	80-100	B/M	Pasture
Dahurian	A,B,C,D,E, K	0-20	B/M	Both
Russian	E	80-100	B/M	Pasture
<b>Native Cool-Season Grasses</b>				
Green needlegrass	G,H,N	10-100	B/M	Both
Reed canarygrass	F,R	50-100	R/T	Both
Wheatgrass				
Slender/Awned/Bearded	A,B,C,D,E,G,J,K,N	0-20	B/M	Both
Western	A,B,C,G,H,J,N	10-100	R/M	Both
Wildrye				
Basin	G,P	50-100	B/T	Pasture
Beardless	J	10-50	R/M	Pasture
Canada	A,B,C,D,G,J,K,N	0-20	B/M	Both
<b>Native Warm-Season Grasses<sup>6</sup></b>				
Bluestem				
Big	G,K	30-100	R/T	Both
Little	G,K	10-50	B/M	Pasture
Sand	G,K	30-100	R/T	Pasture
Gramma				
Blue	G,K	20-100	B/S	Pasture
Sideoats	G,K	20-100	R/S	Pasture
Indiangrass	G,K	30-100	R/T	Pasture
Prairie cordgrass	G,K	10-100	R/T	Both
Prairie sandreed	G,K	30-100	R/T	Pasture
Switchgrass <sup>5</sup>	G,H,K	30-100	R/T	Both
American vetch	J,K,N,P	0-20	Pr/P	Pasture
Canada milkvetch	J,K,N,P	0-5	E/P	Both
Purple prairieclover	J,K,N,P	0-20	E/P	Pasture
White prairieclover	J,K,N,P	0-20	E/P	Pasture

<b>Table 1. MIXTURE COMPATABILITY AND ALLOWABLE LIMITS</b>				
<b>Species</b>	<b>Mixture Compatability<sup>1</sup></b>	<b>Mixture % Min.-Max.<sup>2</sup></b>	<b>Growth Characteristics<sup>3</sup></b>	<b>Best Use<sup>8</sup></b>
<b>Introduced Legumes <sup>7</sup></b>				
Alfalfa	A,B,C,D,E,N,P	10-100	E/P	Both
Birdsfoot trefoil	A,B,C,D,E,N	20-100	Pr/P	Both
Cicer milkvetch	A,B,C,D,E,J,N,P	10-50	Pr/P	Both
Clover				
Alsike	F,J	10-50	Pr/P	Both
Ladino (white clover)	A,B,C,D,E,N,P	0-30	Pr/P	Both
Red <sup>4</sup>	A,B,C,D,E,N,P	0-30	Pr/P	Both
Strawberry	J,P	0-30	E/P	Pasture
Sweet	A,B,C,D,E,J,N,P	0-10	E/B	Both
Hairy vetch	A,B,C,D,E,J,N,P	0-10	Pr/A	Both
Sainfoin	A,B,C,D,E,J,N,P	10-50	E/P	Both

<sup>1</sup> Based on compatibility of species and suitability groups, species with the same letter can be mixed.

<sup>2</sup> As level of grazing management increases, seeding mixture diversity may be increased. Consult area or state specialist for guidance with these situations.

<sup>3</sup> R = Rhizomatous, B = Bunch, S = Short (<18"), M = Medium (18" to 36"), T = Tall (> 36"), A = Annual, B = Biennial, P = Perennial, E = Erect, Pr = Prostrate. See <http://plants.usda.gov/> for additional information.

<sup>4</sup> Limited to MLRA 56.

<sup>5</sup> Research indicates that pure stands of switchgrass may be toxic to horses, goats and sheep.

<sup>6</sup> Warm season native grasses will not be mixed with introduced legumes due to competitive nature of the common introduced legumes.

<sup>7</sup> On slopes greater than 9%, the seeding mixture will contain at least 50% rhizomatous species.

<sup>8</sup> Indicates whether species is recommended for use as pasture, hayland or both. Based upon growth habit.

SPECIES SUITABILITY - MLRA 53A													
Species	Clayey Subsoil	Claypan	Droughty Loam	Limy Upland	Loam	Over flow	Saline	Sand	Very Shallow to Gravel	Steep Loam	Subirrigated	Very Droughty Loam	Wet
<b>Introduced Grasses</b>													
Bromegrass													
Meadow	G	-	F	-	G	G	-	-	-	G	G	F	F
Smooth	G	-	F	F	G	G	-	-	-	G	G	F	F
Creeping foxtail	-	-	-	-	-	F	F	-	-	-	F	-	G
Wheatgrass													
"NewHy" hybrid wheatgrass	G	F	G	F	G	G	G	F	F	G	G	F	-
Crested	G	F	G	G	F	F	-	-	G	G	-	G	-
Intermediate	G	-	F	F	G	G	-	F	F	G	F	F	F
Pubescent	G	-	F	F	G	G	-	F	F	G	F	F	F
Tall	F	F	F	-	F	F	G	-	-	F	G	-	-
Wildrye													
Altai	G	-	F	-	G	G	F	-	-	G	F	-	-
Dahurian	-	-	-	-	-	-	-	-	-	G	-	-	-
Russian	G	-	F	-	G	G	F	F	F	G	-	-	-
<b>Native Cool Season Grasses</b>													
Green needlegrass	G	F	G	F	G	G	-	-	-	G	F	-	-
Reed canarygrass	-	-	-	-	-	F	-	-	-	-	F	-	G
Wheatgrass													
Slender/Awned/Bearded	G	G	G	F	G	G	G	F	F	G	G	F	G
Western	G	G	G	F	G	G	G	F	F	G	G	G	F
Wildrye													
Basin	-	-	F	-	F	F	F	-	-	F	G	-	-
Beardless	-	-	-	-	-	-	G	-	-	-	-	-	-
Canada	-	-	G	-	F	G	F	G	-	F	F	-	-
G - Good adaptation for forage production on this group of soils in this MLRA													
F - Fair adaptation but will not produce at its highest potential													

SPECIES SUITABILITY - MLRA 53A (continued)													
Species	Clayey Subsoil	Claypan	Droughty Loam	Limy Upland	Loam	Over flow	Saline	Sand	Very Shallow to Gravel	Steep Loam	Subirrigated	Very Droughty Loam	Wet
<b>Native Warm Season Grasses</b>													
Bluestem													
Big	F	-	F	-	G	G	-	-	-	F	G	-	-
Little	F	-	G	G	F	F	-	G	G	G	G	G	-
Sand	-	-	G	-	-	-	-	G	G	F	-	F	-
Grama													
Blue	-	-	-	-	-	-	-	-	G	G	-	-	-
Sideoats	F	-	G	G	F	G	-	F	F	G	-	F	-
Indiangrass	F	-	F	-	F	G	-	-	-	-	G	-	-
Prairie sandreed	-	-	G	G	-	-	-	G	G	G	-	F	-
Switchgrass	F	-	F	-	G	G	F	-	-	F	G	-	F
<b>Native Legumes</b>													
American vetch	-	-	-	-	-	-	-	-	-	F	-	-	-
Canada milkvetch	F	-	F	F	G	G	-	-	-	F	F	-	-
Purple prairieclover	F	-	G	F	G	F	-	F	G	G	-	F	-
White prairieclover	F	-	G	F	G	F	-	G	G	G	-	G	-
<b>Introduced Legumes</b>													
Alfalfa	G	F	G	F	G	G	-	G	F	G	F	G	-
Birdsfoot trefoil	F	-	-	-	F	-	-	-	-	-	-	-	-
Cicer milkvetch	F	-	G	F	G	G	-	F	-	G	F	-	-
Clover													
Alsike		-	-	-	-	F	F	-	-	-	F	-	F
Sweet	-	-	-	-	-	-	-	-	F	G	-	-	-
Hairy vetch	-	-	-	-	-	-	-	-	-	F	-	-	-
Sainfoin	-	-	G	F	F	-	-	F	-	F	-	F	-
G - Good adaptation for forage production on this group of soils in this MLRA													
F - Fair adaptation but will not produce at its highest potential													

SPECIES SUITABILITY - MLRA 53B													
Species	Clayey Subsoil	Claypan	Droughty Loam	Limy Upland	Loam	Over flow	Saline	Sand	Very Shallow to Gravel	Steep Loam	Subirrigated	Very Droughty Loam	Wet
<b>Introduced Grasses</b>													
Bromegrass													
Meadow	G	-	F	-	G	G	-	-	-	G	G	-	-
Smooth	G	-	F	G	G	G	-	-	-	G	G	F	-
Creeping foxtail	-	-	-	-	-	F	F	-	-	-	F	-	G
Wheatgrass													
"NewHy" hybrid wheatgrass	G	F	G	F	G	G	G	F	F	G	G	F	-
Crested	G	F	G	G	G	G	-	F	G	G	G	G	-
Intermediate	G	-	F	F	G	G	-	F	F	G	F	F	-
Pubescent	G	-	F	F	G	G	-	F	F	G	F	F	-
Siberian	-	-	F	G	-	-	-	G	-	F	-	G	-
Tall	G	F	F	-	G	F	G	-	-	F	G	-	G
Wildrye													
Altai	G	-	F	-	G	G	F	-	-	G	F	-	-
Dahurian	G	F	G	F	G	G	-	F	-	G	F	F	-
Russian	G	F	G	F	G	F	F	F	F	G	-	F	-
<b>Native Cool Season Grasses</b>													
Green needlegrass	G	F	G	F	G	G	-	-	-	G	F	F	-
Reed canarygrass	-	-	-	-	-	F	-	-	-	-	F	-	G
Wheatgrass													
Slender/Awned/Bearded	G	G	G	G	G	G	G	F	F	G	G	F	F
Western	G	G	G	G	G	G	G	F	F	G	G	F	F
Wildrye													
Basin	-	-	F	-	F	F	-	-	-	F	-	-	-
Beardless	-	F	-	-	-	-	G	-	-	-	-	-	-
Canada	-	-	G	-	G	G	F	G	-	F	F	F	-
G - Good adaptation for forage production on this group of soils in this MLRA													
F - Fair adaptation but will not produce at its highest potential													

SPECIES SUITABILITY - MLRA 53B (continued)													
Species	Clayey Subsoil	Claypan	Droughty Loam	Limy Upland	Loam	Over flow	Saline	Sand	Very Shallow to Gravel	Steep Loam	Subirrigated	Very Droughty Loam	Wet
<b>Native Warm Season Grasses</b>													
Bluestem													
Big	F	-	F	-	G	G	-	-	-	F	G	-	-
Little	F	-	G	G	G	F	-	G	G	G	G	G	-
Sand	-	-	G	-	-	-	-	G	G	-	-	F	-
Grama													
Blue	G	F	G	G	G	F	-	F	G	G	-	G	-
Sideoats	F	-	G	G	G	G	-	F	F	G	-	F	-
Indiangrass	-	-	-	-	F	F	-	-	-	-	F	-	-
Prairie cordgrass	-	-	-	-	-	-	-	-	-	-	-	-	G
Prairie sandreed	-	-	G	G	F	-	-	G	G	G	-	F	-
Switchgrass	F	-	F	-	G	G	F	-	-	F	G	-	G
<b>Native Legumes</b>													
American vetch	F	-	G	G	G	G	-	F	-	G	F	F	-
Canada milkvetch	F	-	F	F	G	G	-	F	-	G	G	-	-
Purple prairieclover	F	-	G	F	G	F	-	G	G	G	-	G	-
White prairieclover	F	-	G	F	G	F	-	G	G	G	-	G	-
<b>Introduced Legumes</b>													
Alfalfa	G	F	G	F	G	G	-	F	F	G	G	F	-
Cicer milkvetch	F	-	G	-	G	G	-	F	-	G	F	-	-
Clover													
Alsike	-	-	-	-	-	F	F	-	-	-	F	-	G
White	F	-	-	-	F	G	-	-	-	-	F	-	-
Sweet	G	F	G	F	G	G	F	F	F	G	G	F	F
Hairy vetch	-	F	F	F	G	G	-	-	-	F	F	-	-
Sainfoin	-	-	G	F	F	-	-	F	-	F	-	F	-
G - Good adaptation for forage production on this group of soils in this MLRA													
F - Fair adaptation but will not produce at its highest potential													

SPECIES SUITABILITY – MLRS 54													
Species	Clayey Subsoil	Claypan	Droughty Loam	Limy Upland	Loam	Over flow	Saline	Sand	Very Shallow to Gravel	Steep Loam	Subirrigated	Very Droughty Loam	Wet
<b>Introduced Grasses</b>													
Bromegrass													
Meadow	F	-	F	-	G	G	-	-	-	F	F	-	-
Smooth	F	-	F	F	G	G	-	-	-	G	F	F	-
Creeping foxtail	-	-	-	-	-	-	F	-	-	-	-	-	G
Wheatgrass													
“NewHy” hybrid wheatgrass	G	F	G	F	G	G	G	F	-	G	F	F	-
Crested	G	F	G	G	G	G	-	F	F	G	G	G	-
Intermediate	F	-	F	F	G	G	-	F	-	G	F	F	-
Pubescent	F	-	F	F	G	G	-	F	-	G	F	F	-
Siberian	F	-	G	G	F	-	-	G	F	F	-	G	-
Tall	F	F	F	-	F	G	G	-	-	F	G	-	G
Wildrye													
Altai	F	-	F	-	G	G	F	-	-	G	-	-	-
Dahurian	G	F	G	F	G	G	-	F	-	G	-	F	-
Russian	G	F	G	F	G	G	F	F	-	G	F	-	-
<b>Native Cool Season Grasses</b>													
Green needlegrass	G	-	G	F	G	G	-	-	-	G	F	-	-
Reed Canarygrass	-	-	-	-	-	F	-	-	-	-	-	-	G
Wheatgrass													
Slender/Awned/Bearded	G	G	G	G	G	G	G	F	F	G	G	F	F
Western	G	G	G	G	G	G	G	F	F	G	G	F	G
Wildrye													
Basin	-	-	F	-	F	F	-	-	-	F	-	-	-
Beardless	-	F	-	-	-	-	G	-	-	-	-	-	-
Canada	-	-	G	-	G	G	F	G	-	F	F	F	-
G - Good adaptation for forage production on this group of soils in this MLRA													
F - Fair adaptation but will not produce at its highest potential													

SPECIES SUITABILITY – MLRS 54 (continued)													
Species	Clayey Subsoil	Claypan	Droughty Loam	Limy Upland	Loam	Over flow	Saline	Sand	Very Shallow to Gravel	Steep Loam	Subirrigated	Very Droughty Loam	Wet
<b>Native Warm Season Grasses</b>													
Bluestem													
Big	-	-	F	-	G	G	-	-	-	F	G	-	-
Little	F	-	G	G	G	F	-	G	G	G	G	F	-
Sand	-	-	G	F	-	-	-	G	G	F	-	F	-
Grama													
Blue	G	F	G	G	G	F	-	F	G	G	-	G	-
Sideoats	F	-	G	G	G	G	-	F	F	G	-	F	-
Prairie cordgrass	-	-	-	-	-	-	-	-	-	-	-	-	G
Prairie sandreed	-	-	G	G	F	-	-	G	G	G	-	F	-
Switchgrass	F	-	F	-	G	G	F	-	-	F	G	-	G
<b>Native Legumes</b>													
American vetch	F	-	G	F	G	G	-	F	-	F	F	F	-
Canada milkvetch	F	-	F	F	G	G	-	F	-	F	F	-	-
Purple prairieclover	F	-	G	F	G	F	-	F	F	G	-	G	-
White prairieclover	F	-	G	F	G	F	-	F	F	G	-	G	-
<b>Introduced Legumes</b>													
Alfalfa	G	F	G	F	G	G	-	F	-	G	G	F	-
Cicer milkvetch	F	-	G	-	G	G	-	F	-	G	F	-	-
Clover													
Alsike	-	-	-	-	-	-	F	-	-	-	-	-	F
White	F	-	-	-	F	G	-	-	-	-	-	-	-
Sweet	G	F	G	F	G	G	F	F	F	G	G	F	F
Hairy vetch	-	F	F	-	F	F	-	-	-	F	F	-	-
Sainfoin	-	-	G	F	F	F	-	F	-	F	-	F	-
G - Good adaptation for forage production on this group of soils in this MLRA													
F - Fair adaptation but will not produce at its highest potential													

SPECIES SUITABILITY - MLRA 55A													
Species	Clayey Subsoil	Claypan	Droughty Loam	Limy Upland	Loam	Over flow	Saline	Sand	Very Shallow to Gravel	Steep Loam	Subirrigated	Very Droughty Loam	Wet
<b>Introduced Grasses</b>													
Bromegrass													
Meadow	G	-	G	F	G	G	-	F	-	G	G	-	-
Smooth	G	F	G	G	G	G	-	F	F	G	G	F	-
Creeping foxtail	-	-	-	-	-	F	F	-	-	-	F	-	G
Timothy	-	-	-	-	-	G	-	-	-	-	-	-	F
Wheatgrass													
"NewHy" hybrid wheatgrass	G	F	G	G	G	G	G	F	F	G	G	F	-
Crested	G	F	G	G	G	G	-	F	F	G	F	G	-
Intermediate	G	F	G	F	G	G	-	F	F	G	F	F	-
Pubescent	G	F	G	F	G	G	-	F	F	G	F	F	-
Tall	G	G	G	-	G	G	G	F	-	G	G	-	F
Wildrye													
Altai	F	-	F	-	F	F	F	F	-	F	F	-	-
Dahurian	G	F	G	F	G	G	-	F	-	G	F	F	-
Russian	F	F	G	F	G	F	F	F	F	G	-	F	-
<b>Native Cool Season Grasses</b>													
Green needlegrass	G	F	G	F	G	G	-	F	F	G	F	F	-
Reed canarygrass	-	-	-	-	-	F	-	-	-	-	F	-	G
Wheatgrass													
Slender/Awned/Bearded	G	G	G	G	G	G	G	F	F	G	G	F	-
Western	G	G	G	G	G	G	G	F	F	G	G	F	G
Wildrye													
Beardless	-	F	-	-	-	-	G	-	-	-	-	-	-
Canada	-	-	G	-	F	G	F	G	-	F	F	-	-
G - Good adaptation for forage production on this group of soils in this MLRA													
F - Fair adaptation but will not produce at its highest potential													

SPECIES SUITABILITY - MLRA 55A (continued)													
Species	Clayey Subsoil	Claypan	Droughty Loam	Limy Upland	Loam	Over flow	Saline	Sand	Very Shallow to Gravel	Steep Loam	Subirrigated	Very Droughty Loam	Wet
<b>Native Warm Season Grasses</b>													
Bluestem													
Big	G	-	F	F	G	G	-	F	-	F	G	-	-
Little	F	-	G	G	G	G	-	G	G	G	G	G	-
Sand	-	-	F	-	F	-	-	G	F	F	-	F	-
Grama													
Blue	G	F	G	G	G	F	-	F	G	G	-	G	-
Sideoats	F	-	G	G	G	G	-	F	F	G	-	F	-
Indiangrass	F	-	F	-	G	G	-	-	-	F	G	-	-
Prairie cordgrass	-	-	-	-	-	-	F	-	-	-	-	-	G
Prairie sandreed	-	-	F	F	F	-	-	G	G	F	-	F	-
Switchgrass	G	-	F	-	G	G	F	F	-	F	G	-	G
<b>Native Legumes</b>													
American vetch	F	-	G	G	G	G	-	F	-	F	F	F	-
Canada milkvetch	F	-	F	G	G	G	-	F	-	F	G	-	-
Purple prairieclover	F	-	G	G	G	F	-	G	G	G	-	G	-
White prairieclover	F	-	G	F	G	F	-	G	G	G	-	G	-
<b>Introduced Legumes</b>													
Alfalfa	G	F	G	F	G	G	-	F	-	G	G	F	-
Birdsfoot trefoil	F	-	F	-	F	G	F	-	-	F	G	-	-
Cicer milkvetch	F	-	G	-	G	G	-	F	-	G	F	-	-
Clover													
Alsike	-	F	-	-	-	F	F	-	-	-	F	-	G
White	G	-	-	-	G	G	-	-	-	-	F	-	-
Red	G	-	F	-	G	G	-	-	-	F	-	-	-
Strawberry	-	-	-	-	F	-	G	-	-	-	-	-	F
Sweet	G	F	G	F	G	G	F	F	F	G	G	G	F
Hairy vetch	F	F	F	F	G	G	-	-	-	F	F	-	-
Sainfoin	-	-	F	F	F	-	-	F	-	F	-	-	-
G - Good adaptation for forage production on this group of soils in this MLRA													
F - Fair adaptation but will not produce at its highest potential													

SPECIES SUITABILITY – MLRA 55B													
Species	Clayey Subsoil	Claypan	Droughty Loam	Limy Upland	Loam	Over flow	Saline	Sand	Very Shallow to Gravel	Steep Loam	Subirrigated	Very Droughty Loam	Wet
<b>Introduced Grasses</b>													
Bromegrass													
Meadow	G	-	G	F	G	G	-	F	-	G	G	-	-
Smooth	G	F	G	G	G	G	-	F	F	G	G	F	-
Creeping foxtail	-	-	-	-	-	F	F	-	-	-	F	-	G
Timothy	G	-	-	-	F	G	-	-	-	-	-	-	F
Wheatgrass													
“NewHy” hybrid wheatgrass	G	G	G	G	G	G	G	G	F	G	G	F	-
Crested	G	F	G	G	G	G	-	F	F	G	F	G	-
Intermediate	G	F	G	F	G	G	-	G	F	G	F	F	-
Pubescent	G	F	G	F	G	G	-	G	F	G	F	F	-
Tall	G	G	G	-	G	G	G	F	-	G	G	-	G
Wildrye													
Altai	F	-	F	-	F	F	F	F	-	F	F	-	-
Dahurian	G	F	F	F	G	G	-	F	-	F	F	F	-
Russian	F	F	G	F	G	F	F	F	F	G	-	F	-
<b>Native Cool Season Grasses</b>													
Green needlegrass	G	F	G	F	G	G	-	F	F	G	F	F	-
Reed canarygrass	-	-	-	-	-	F	-	-	-	-	F	-	G
Wheatgrass													
Slender/Awned/Bearded	G	G	G	G	G	G	G	F	F	G	G	F	-
Western	G	G	G	G	G	G	G	F	F	G	G	F	F
Wildrye													
Beardless	-	F	-	-	-	-	G	-	-	-	-	-	-
Canada	-	-	F	-	F	G	F	G	-	F	F	-	-
G - Good adaptation for forage production on this group of soils in this MLRA													
F - Fair adaptation but will not produce at its highest potential													

SPECIES SUITABILITY – MLRA 55B (continued)													
Species	Clayey Subsoil	Claypan	Droughty Loam	Limy Upland	Loam	Over flow	Saline	Sand	Very Shallow to Gravel	Steep Loam	Subirrigated	Very Droughty Loam	Wet
<b>Native Warm Season Grasses</b>													
Bluestem													
Big	G	-	F	F	G	G	-	F	-	F	G	-	-
Little	F	-	G	G	G	G	-	G	G	G	G	G	-
Sand	-	-	F	-	F	-	-	G	F	F	-	F	-
Grama													
Blue	G	F	G	G	G	F	-	F	G	G	-	G	-
Sideoats	F	-	G	G	G	G	-	F	F	G	-	F	-
Indiangrass	F	-	F	-	G	G	-	-	-	F	G	-	-
Prairie cordgrass	-	-	-	-	-	-	F	-	-	-	-	-	G
Prairie sandreed	-	-	F	F	F	-	-	G	F	F	-	F	-
Switchgrass	G	-	F	-	G	G	F	F	-	F	G	-	G
<b>Native Legumes</b>													
American vetch	F	-	G	G	G	G	-	F	-	F	F	F	-
Canada milkvetch	F	-	F	F	G	G	-	F	-	F	G	-	-
Purple prairieclover	F	-	G	G	G	F	-	G	G	G	-	G	-
White prairieclover	F	-	G	F	G	F	-	G	G	G	-	G	-
<b>Introduced Legumes</b>													
Alfalfa	G	F	G	F	G	G	-	F	-	G	G	F	-
Birdsfoot trefoil	F	-	F	-	F	G	F	-	-	F	G	-	-
Cicer milkvetch	F	-	G	-	G	G	-	F	-	G	F	-	-
Clover													
Alsike	-	F	-	-	-	F	F	-	-	-	F	-	G
White	G	-	-	-	G	G	-	-	-	-	F	-	-
Red	G	-	F	-	F	G	-	-	-	F	-	-	-
Strawberry	-	-	-	-	F	-	G	-	-	-	-	-	F
Sweet	G	F	G	F	G	G	F	F	F	G	G	F	F
Hairy vetch	F	F	F	F	G	G	-	-	-	-	F	-	-
Sainfoin	-	-	F	F	F	-	-	F	-	F	-	-	-
G - Good adaptation for forage production on this group of soils in this MLRA													
F - Fair adaptation but will not produce at its highest potential													

SPECIES SUITABILITY – MLRA 56												
Species	Clayey Subsoil	Claypan	Droughty Loam	Limy Upland	Loam	Over flow	Saline	Sand	Very Shallow to Gravel	Subirrigated	Very Droughty Loam	Wet
<b>Introduced Grasses</b>												
Bromegrass												
Meadow	G	-	G	F	G	G	-	G	-	G	-	F
Smooth	G	F	G	-	G	G	-	F	F	G	F	-
Creeping foxtail	-	-	-	-	-	F	F	-	-	F	-	G
Wheatgrass												
“NewHy” hybrid wheatgrass	G	F	G	G	G	G	G	G	F	G	F	-
Crested	G	F	G	G	G	G	-	F	F	-	F	-
Intermediate	G	F	G	F	G	G	-	G	F	F	F	-
Pubescent	G	F	G	F	G	G	-	G	F	F	F	-
Tall	G	G	G	-	G	G	G	F	-	G	-	-
Wildrye												
Altai	F	-	F	-	F	F	F	F	-	F	-	-
Dahurian	G	F	F	F	G	G	-	F	-	F	F	F
Russian	G	F	G	F	G	G	F	F	F	-	F	-
<b>Native Cool Season Grasses</b>												
Green needlegrass	G	F	G	F	G	G	-	F	F	F	F	-
Reed canarygrass	-	-	-	-	-	F	-	-	-	G	-	G
Wheatgrass												
Slender/Awned/Bearded	G	F	G	F	G	G	G	F	F	G	F	-
Western	G	G	G	F	G	G	G	F	F	G	F	F
Wildrye												
Beardless	-	F	-	-	-	-	G	-	-	-	-	-
Canada	-	-	F	-	F	G	F	G	-	F	-	-
G - Good adaptation for forage production on this group of soils in this MLRA												
F - Fair adaptation but will not produce at its highest potential												

SPECIES SUITABILITY – MLRA 56 (continued)												
Species	Clayey Subsoil	Claypan	Droughty Loam	Limy Upland	Loam	Over flow	Saline	Sand	Very Shallow to Gravel	Subirrigated	Very Droughty Loam	Wet
<b>Native Warm Season Grasses</b>												
Bluestem												
Big	G	-	F	F	G	G	-	F	-	G	-	-
Little	F	-	G	G	G	G	-	G	F	G	F	-
Sand	-	-	F	-	F	F	-	G	F	-	F	-
Grama												
Blue	G	F	G	G	G	F	-	F	F	-	F	-
Sideoats	F	-	G	G	G	G	-	F	F	-	F	-
Indiangrass	F	-	F	-	G	G	-	F	-	G	-	-
Prairie cordgrass	-	-	-	-	-	-	F	-	-	-	-	G
Prairie sandreed	-	-	F	F	F	-	-	G	F	-	F	-
Switchgrass	G	-	F	-	G	G	-	F	-	G	-	F
<b>Native Legumes</b>												
American vetch	F	-	F	G	G	G	-	F	-	-	F	-
Canada milkvetch	F	-	F	-	G	G	-	F	-	F	-	-
Purple prairieclover	-	-	G	G	G	F	-	G	G	-	G	-
White prairieclover	F	-	G	F	G	F	-	G	G	-	G	-
<b>Introduced Legumes</b>												
Alfalfa	G	F	G	F	G	G	-	F	-	F	-	-
Birdsfoot trefoil	F	-	F	-	F	G	F	-	-	G	-	-
Cicer milkvetch	F	-	G	-	G	G	-	G	-	F	-	-
Clover												
Alsike	-	-	-	-	-	-	F	-	-	F	-	-
White	G	-	-	-	G	G	-	-	-	F	-	-
Red	G	-	F	-	G	G	-	-	-	-	-	-
Sweet	G	F	G	F	G	G	F	F	F	G	F	F
Hairy vetch	F	F	F	F	G	G	-	-	-	F	-	-
Sainfoin	-	-	F	F	F	F	-	F	-	-	-	-
G - Good adaptation for forage production on this group of soils in this MLRA												
F - Fair adaptation but will not produce at its highest potential												

SPECIES SUITABILITY – MLRA 58C									
Species	Clayey Subsoil	Claypan	Droughty Loam	Limy Upland	Loam	Over flow	Sand	Very Droughty Loam	Wet
<b>Introduced Grasses</b>									
Bromegrass									
Meadow	-	-	-	-	F	G	-	-	-
Smooth	F	-	F	F	G	G	-	F	-
Creeping foxtail	-	-	-	-	-	-	-	-	G
Wheatgrass									
“NewHy” hybrid wheatgrass	-	F	G	F	G	G	F	F	-
Crested	G	-	G	G	G	G	F	G	-
Intermediate	F	-	F	-	G	G	F	F	-
Pubescent	F	-	F	-	G	G	F	F	-
Siberian	-	-	F	G	F	-	G	G	-
Tall	-	-	-	-	F	G	-	-	F
Wildrye									
Altai	-	-	F	-	F	G	-	-	-
Dahurian	G	F	G	F	G	G	F	F	F
Russian	-	-	F	-	F	G	F	F	-
<b>Native Cool Season Grasses</b>									
Green needlegrass	G	-	F	-	G	G	-	-	-
Reed canarygrass	-	-	-	-	-	F	-	-	G
Wheatgrass									
Slender/Awned/Bearded	G	F	F	F	G	G	F	G	G
Western	G	G	F	F	G	G	F	F	F
Wildrye									
Basin	-	-	F	-	F	F	-	-	-
Canada	-	-	G	-	G	G	G	-	-
G - Good adaptation for forage production on this group of soils in this MLRA									
F - Fair adaptation but will not produce at its highest potential									

SPECIES SUITABILITY – MLRA 58C (continued)									
Species	Clayey Subsoil	Claypan	Droughty Loam	Limy Upland	Loam	Over flow	Sand	Very Droughty Loam	Wet
<b>Native Warm Season Grasses</b>									
Bluestem									
Big	-	-	F	-	F	G	-	-	F
Little	-	-	G	G	G	F	G	F	-
Sand	-	-	G	-	-	F	G	F	-
Grama									
Blue	G	F	G	G	G	F	F	G	-
Sideoats	F	-	G	G	G	G	F	F	-
Prairie cordgrass	-	-	-	-	-	-	-	-	G
Prairie sandreed	-	-	G	-	-	-	G	F	-
Switchgrass	F	-	-	-	F	G	-	-	G
<b>Native Legumes</b>									
American vetch	F	-	G	F	G	G	F	F	-
Canada milkvetch	F	-	F	F	G	G	-	-	-
Purple prairieclover	F	-	G	F	G	F	F	F	-
White prairieclover	F	-	G	F	G	F	G	F	-
<b>Introduced Legumes</b>									
Alfalfa	F	F	F	-	G	G	F	F	-
Cicer milkvetch	F	-	G	-	G	G	F	-	-
Clover									
Alsike	-	-	-	-	-	-	-	-	G
White	-	-	-	-	F	F	-	-	-
Sweet	G	F	G	F	G	G	F	G	F
Hairy vetch	-	-	-	-	-	F	-	-	-
Sainfoin	-	-	G	F	F	-	F	F	-
G - Good adaptation for forage production on this group of soils in this MLRA									
F - Fair adaptation but will not produce at its highest potential									

SPECIES SUITABILITY – MLRA 58D									
Species	Clayey Subsoil	Claypan	Droughty Loam	Limy Upland	Loam	Over flow	Sand	Very Droughty Loam	Wet
<b>Introduced Grasses</b>									
Bromegrass									
Meadow	F	-	-	-	F	F	-	-	-
Smooth	F	F	F	-	F	F	-	-	-
Creeping foxtail	-	-	-	-	-	-	-	-	G
Wheatgrass									
“NewHy” hybrid wheatgrass	-	F	F	F	-	-	F	-	-
Crested	G	F	G	G	G	G	G	G	-
Intermediate	G	F	F	F	G	G	-	-	-
Pubescent	G	F	G	G	G	G	F	F	-
Tall	-	G	F	-	F	-	-	-	F
Wildrye									
Altai	F	-	G	F	G	G	F	F	-
Russian	G	F	G	G	G	-	-	G	-
<b>Native Cool Season Grasses</b>									
Green needlegrass	G	F	G	F	G	G	-	F	-
Reed canarygrass	-	-	-	-	-	-	-	-	G
Wheatgrass									
Slender/Awned/Bearded	-	F	-	-	-	-	-	-	-
Streambank/Thickspike	F	-	G	G	G	F	F	G	-
Western	G	G	G	G	G	G	F	G	F
Wildrye									
Basin	-	-	G	-	G	G	-	F	-
Beardless	-	F	-	-	-	-	-	-	-
G - Good adaptation for forage production on this group of soils in this MLRA									
F - Fair adaptation but will not produce at its highest potential									

SPECIES SUITABILITY - MLRA 58D (continued)									
Species	Clayey Subsoil	Claypan	Droughty Loam	Limy Upland	Loam	Over flow	Sand	Very Droughty Loam	Wet
<b>Native Warm Season Grasses</b>									
Bluestem									
Big	F	-	-	F	F	F	F	-	-
Little	F	-	G	G	G	G	G	G	-
Sand	-	-	F	-	F	-	G	F	-
Grama									
Sideoats	G	-	G	G	G	F	F	G	-
Indiangrass	-	-	-	F	-	-	-	-	-
Prairie sandreed	-	-	F	F	F	-	G	F	-
Switchgrass	F	-	-	-	F	F	F	-	F
<b>Native Legumes</b>									
Canada milkvetch	F	-	-	-	F	F	-	-	-
Purple prairieclover	F	-	G	F	F	F	F	G	-
White prairieclover	F	-	G	F	F	F	F	G	-
<b>Introduced Legumes</b>									
Alfalfa	G	F	G	G	G	G	G	G	-
Cicer milkvetch	G	-	G	G	G	G	G	G	-
Clover									
Alsike	-	-	-	-	-	-	-	-	F
Sainfoin	F	-	F	F	F	F	-	F	-
G - Good adaptation for forage production on this group of soils in this MLRA									
F - Fair adaptation but will not produce at its highest potential									