

Introduction

The “Guide to Grasses” handbook was designed to offer you an appreciation and brief technical reference to the most valuable plants in the central Great Plains and Rocky Mountain Region. The focus is on successful grasses for seeding in Colorado, Kansas, Wyoming, Nebraska, Oklahoma and Texas, as well as neighboring states outside of this region.

In this edition we have described 92 common grasses and legume species to help our customers make better selections for successful planting. This guide may not be the only source of information for selection and care of grasses and legumes. However, we hope you find it to be a handy reference to help you in your selection of the best plant species, as well as useful when you are out in the field. It is advisable to contact the plant experts at Pawnee Buttes Seed Inc., and consult with your local Natural Resources Conservation Service office for additional information before planting.

Don Hajar has owned Pawnee Buttes Seed, Inc. since 1998. He brings with him more than 30 years in the seed industry as a business owner, teacher, and advisor to universities, neighbors, businesses and customers alike. Pawnee Buttes Seeds sells grasses, forbs, shrubs, alfalfas, legumes, wetland and riparian species, and offers expertise in turf, reclamation and forage. We pride ourselves on a friendly and knowledgeable staff, and we look forward to helping you with your planting needs. Please feel free to call us with any questions at (800) 782-5947.

Dedication

This book is dedicated to the memory of Janine Hajar, co-owner of Pawnee Buttes Seed, wife, and friend to everyone. Janine’s spirit and hard work were a huge part of the success of Pawnee Buttes Seed, as was her passion for the western seed industry.

She is greatly missed.

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February 2016
Fourth Edition

QUICK REFERENCE GUIDE			Uses				Soil Tolerances*				Seeding Rate					
*Legend: 1=Slight tolerance, 2=Moderate tolerance 3=High tolerance			Bunch/Sod	Cool/Warm	Native/Intro.	Forage	Reclamation	Restoration	Turf	Clay	Sand	Acid	Salt	Min. ppt inch	Field lbs./ac.	Turf lbs./1000 s.f.
Common Name																
Alkaligrass	Weeping	B	C	N		x	x		3			3	16	2.0-3.0	1.0-1.5	
Bentgrass	Colonial	S	C	I		x		x	1	1	1		18	1.0-2.0	0.5-1.0	
Bentgrass	Creeping	S	C	I				x	1		1	1	18	0.5-1.0	0.5-1.0	
Bentgrass	Redtop	S	C	I	x	x		x			2		24	4.0-5.0	—	
Bermudagrass		S	W	I	x			x	1			2	18	11-23	1.0-1.5	
Bluegrass	Alpine	B	C	N				x			2		22	1.0-2.0	—	
Bluegrass	Annual	B	C	I		x		x				1	18	1.0-2.0	1.0-2.0	
Bluegrass	Bulbous	B	C	I	x								16	3.0-6.0	—	
Bluegrass	Canada	B	C	I	x			x	1	1		2	15	0.5-1.0	1.0-2.0	
Bluegrass	Canby	B	C	N	x			x		1	1	1	16	1.0-2.0	—	
Bluegrass	Fowl	S	C	N				x				1	18	1.0-2.0	1.0-2.0	
Bluegrass	Glaucous	B	C	I		x		x				1	18	0.5-1.0	1.0-2.0	
Bluegrass	Kentucky	S	C	I	x			x			1		18	1.0-2.0	1.0-1.5	
Bluegrass	Rough	S	C	I				x				1	18	1.0-2.0	1.0-1.5	
Bluegrass	Sandburg	B	C	N	x		x				2		16	1.0-3.0	—	
Bluestem	Big	S	W	N	x	x	x			2			18	6.0-12	—	
Bluestem	Caucasian	S	W	I	x							1	16	3.0-7.0	—	
Bluestem	Little	B	W	N	x		x			1			15	3.5-7.0	—	
Bluestem	Sand	S	W	N	x	x	x			3			15	8.0-16	—	
Bluestem	Yellow	B	W	I	x	x						1	15	1.0-2.5	—	
Bristlegrass	Plains	B	W	N	x		x			2		2	12	3.0-6.0	—	
Brome	Meadow	B	C	I	x							1	16	12-24	—	
Brome	Mountain	B	C	N	x		x				1		18	10-20	—	
Brome	Smooth	S	C	I	x	x						1	14	6.0-10	—	
Buffalograss		S	W	N	x	x	x	x	2	1		2	10	11-20	1.5-2.0	
Canarygrass	Reed	S	C	N	x	x	x			1	1	2	18	3.0-6.0	—	
Cordgrass	Prairie	S	W	N	x		x					2	18	5.0-7.0	—	
Dropseed	Sand	B	W	N	x	x	x			3		1	10	0.2-1.0	—	
Fescue	Alpine	S	C	N	x	x					2		20	2.0-4.0	—	
Fescue	Arizona	B	C	N	x	x					1		14	2.0-5.0	—	
Fescue	Chewing	S	C	I				x	1		1		18	1.5-3.0	3.5-4.5	
Fescue	Creeping Red	S	C	I				x	1		1		18	1.5-3.0	3.5-4.5	
Fescue	Hard	B	C	I	x	x		x			1	1	14	1.5-3.0	3.0-4.0	
Fescue	Idaho	B	C	N	x	x	x				1	1	15	2.0-3.5	—	
Fescue	Rocky Mountain	B	C	N	x	x	x	x		1	1	1	15	1.5-3.0	3.0-4.0	
Fescue	Rough	B	C	N	x		x				1		12	4.0-8.0	—	
Fescue	Sheep	B	C	N	x			x			2		10	1.5-3.0	3.0-4.0	
Fescue	Tall	B	C	I	x	x		x	1		1	2	16	4.0-8.0	7.0-9.0	
Foxtail	Creeping Meadow	S	C	I	x	x					2	1	20	1.5-3.0	—	
Galleta	James'	S	W	N	x	x	x		1	1		2	10	2.0-10	—	
Gramma	Black	S	W	N	x		x				1	1	16	1.0-2.0	—	
Gramma	Blue	S	W	N	x		x	x	1	1		2	12	1.0-3.0	1.5-3.0	
Gramma	Sideoats	B	W	N	x		x			1			12	4.0-8.0	—	
Hairgrass	Tufted	B	C	N	x		x				3		20	1.0-1.5	—	
Indiangrass	Yellow	S	W	N	x	x	x		2	2	2	2	16	4.5-10	—	
Junegrass	Prairie	B	C	N	x		x			1			16	0.5-1.0	—	

QUICK REFERENCE GUIDE				Uses				Soil Tolerances*				Seeding Rate					
*Legend: 1=Slight tolerance, 2=Moderate tolerance 3=High tolerance				Bunch/Sod	Cool/Warm	Native/Intro.	Forage	Reclamation	Restoration	Turf	Clay	Sand	Acid	Salt	Min. ppt inch	Field lbs./ac.	Turf lbs./1000 s.f.
Common Name		B	W	I	x												
Kleingrass		B	W	I	x					2	1		2	18	1.0-2.0	—	
Lovegrass	Sand	B	W	N	x	x	x				3			14	1.0-2.0	—	
Lovegrass	Weeping	B	W	I	x	x		x			2			16	1.0-2.0	—	
Muhly	Spike	B	W	N	x		x			1	1		1	16	1.0-1.5	—	
Needlegrass	Green	B	C	N	x	x	x			3			1	16	5.0-10.0	—	
Needlegrass	Needle and Thread	B	C	N	x		x				2			10	7.0-14.0	—	
Orchardgrass		B	C	I	x			x		3	1	2	1	18	1.5-3.0	—	
Ricegrass	Indian	B	C	N	x		x			1	3		2	8	5.0-10.0	—	
Ryegrass	Annual/Italian	B	C	I	x			x		2	2		1	16	4.0-8.0	7.0-9.0	
Ryegrass	Perennial	B	C	I	x			x		2	2		1	16	4.0-8.0	7.0-9.0	
Sacaton	Alkali	B	C	N	x	x	x			3	1		3	10	0.5-1.5	—	
Saltgrass	Inland	S	W	N		x	x			2	2		3	12	5.0-10.0	—	
Sandreed	Prairie	S	W	N	x	x	x				3			12	4.0-7.0	—	
Sprangletop	Green	B	W	N	x		x				2			11	1.5-2.5	—	
Squirreltail	Bottlebrush	B	C	N	x	x	x			1	2		3	8	4.0-9.0	—	
Switchgrass		S	W	N	x		x				1	2	2	16	2.0-4.0	—	
Timothy		B	C	I	x	x						1	1	16	1.0-2.0	—	
Timothy	Alpine	S	C	N	x		x					2		18	1.0-2.0	—	
Wheatgrass	Beardless	B	C	N	x		x						1	10	5.0-10.0	—	
Wheatgrass	Bluebunch	B	C	N	x		x						1	10	5.0-10.0	—	
Wheatgrass	Crested	B	C	I	x	x		x			1	2		9	3.5-8.0	3.0-5.0	
Wheatgrass	Hybrid	S	C	I	x	x							3	13	10.0-14.0	—	
Wheatgrass	Intermediate	S	C	I	x	x					1		1	15	5.0-15.0	—	
Wheatgrass	Pubescent	S	C	I	x	x					1		2	14	5.0-15.0	—	
Wheatgrass	Siberian	B	C	I	x							1	2	9	4.5-9.5	—	
Wheatgrass	Slender	B	C	N	x	xc	x						2	12	5.5-11.0	—	
Wheatgrass	Streambank	S	C	N		x	x	x		1			1	10	5.5-11	4.0-6.0	
Wheatgrass	Tall	B	C	I	x	x							3	16	10.0-20.0	—	
Wheatgrass	Thickspike	S	C	N	x	x	x				1		2	10	5.0-10.0	—	
Wheatgrass	Western	S	C	N	x	x	x			2			2	14	7.0-15.0	—	
Wildrye	Altai	B	C	I	x	x							2	14	15.0-20.0	—	
Wildrye	Basin	B	C	N	x	x	x						2	12	5.0-10.0	—	
Wildrye	Beardless	S	C	N	x	x	x						3	14	6.5-13.0	—	
Wildrye	Blue	B	C	N	x		x					2		14	7.0-13.0	—	
Wildrye	Canada	B	C	N	x		x						2	12	5.0-10.0	—	
Wildrye	Mammoth	S	C	I		x					2		2	12	5.0-10.0	—	
Wildrye	Russian	B	C	I	x	x				2			2	8	5.0-10.0	—	
Wildrye	Virginia	B	C	N	x		x					2		24	10.0-20.0	—	
LEGUMES																	
Alfalfa		B	C	I	x							2	1	16	6.0-10.0	—	
Clover	Alsike	S	C	I	x	x				3			2	16	6.0-8.0	—	
Clover	Red	B	C	I	x	x						2		12	3.0-6.0	—	
Clover	White	S	C	I	x	x		x					1	14	4.0-6.0	3.0-5.0	
Milkvetch	Chickpea	S	C	I	x	x						1	1	15	6.0-12.0	—	
Sainfoin		S	C	I	x									16	20.0-25.0	—	
Sweetclover	Yellow	B	C	I	x	x					1	1	1	10	3.0-6.0	—	
Trefoil	Birdsfoot	B	C	I	x							1		18	3.0-6.0	—	

Acknowledgments

Wendell G. Hassell, Plant Scientist, authored, assembled, and compiled the information for "Guide to Grasses". Much of the information and illustrations were adapted from the following USDA and USDI publications, as well as a booklet assembled by Garrison Seed & Company Inc.:

- 1) Anderson, James, and Sharp, W. Curtis, Grass Varieties in the United States. USDA Agriculture Handbook No.170, USDA, Soil Conservation Service, revised 1994
- 2) Clinton H. Wasser, Ecology and Culture of Selected Species Useful in Revegetating Disturbed Lands in the West, USDI FWS/OBS-82/56, Sept. 1982
- 3) Hafenrickter, A. L., and et al., Grasses and Legumes for Soil Conservation in the Pacific Northwest and Great Basin States. Agriculture Handbook 339, Soil Conservation Service, U.S. Department of Agriculture, Washington, DC – April 1968
- 4) Horace L. Leithead, Lewis L. Yarlett, and Thomas N. Shiflet, 100 Forage Grasses in 11 Southern States, USDA Handbook No. 389, Feb.1971
- 5) Humphrey, Robert R., Forage Production on Arizona Ranges, October 1996
- 6) USDA NRCS PLANTS Web site

Technical Illustrations by Paula Nicholas, Doris Peacock, Wendell Hassell, and courtesy of Jennifer Shoemaker, U.S. Geological Surveys, USDI.

Pawnee Buttes Seed Inc. is grateful to many people and government agencies for information used in this guide.

Definitions of Terms and Abbreviations

ppt	= Average Annual Precipitation.
PLS	= Pure Live Seed.
Variety	= Strains or cultivars selected from the species for desirable characteristic.
Maps	= Indicate general area of species adaptation.
Forage	= Plants for range, pasture, hay, livestock or wildlife food.
Reclamation	= Plants adapted to extreme soil conditions such as acidity, salinity, clay or wet soils.
Restoration	= Restoring native plant communities.

ORGANIC SEED: USDA definition of an organic agricultural product is given as, "produced and handled without the use of synthetic chemicals." Also, "not produced on land on which any prohibited substances, including synthetic chemicals, have been applied during the three years immediately preceding harvest of the agricultural products." In addition, this act contains regulations for certifying operations as organic.

GENETICALLY MODIFIED ORGANISMS (GMOs) refer to plants and animals with an altered genetic make-up. GMOs are generally altered or manipulated by a non-natural means in order to incorporate genes from another organism. Usually genetic engineering (GE) is done to achieve a trait not normally held by an organism, such as longer shelf life, disease resistance or different colors or flavors.

Seeding Rate Recommendations

Seeding rates are generally shown as a range based on several factors: size of seed (numbers of seeds per pound), planting method (drilling or broadcasting), irrigated or non-irrigated plantings, annual precipitation, and/or steep slope, critical areas.

The recommended seeding rates (pounds PLS per acre) are calculated from the average number of seeds (PLS) per square foot: Twenty (20) seeds (PLS) per square foot is generally used as the base rate of seeding and seeding rates generally range from 20 to 40 seeds (PLS) per square foot. The seeding rate should be increased from the minimum if average annual precipitation is greater than 18 inches or the seed is extremely small. Forty seeds/square foot should be used if the site is steep or irrigated. Anytime seed is being applied with a broadcast seeder the seeding rate should be doubled. Consult a specialist if you have an unusual situation or any questions.

For seeding turf grass the seeding rate recommended is given as lbs. per 1,000 sq. ft. The seeding rate for turf is approximately the same (lbs. PLS per 1,000-sq. ft.) as the forage rate (lbs. PLS per acre).

General Seeding Date Recommendations

Cool season and hardseed species should be planted in the fall or early spring. Warm season species should be planted in a fallowed seedbed, in the spring or summer prior to the most reliable rainy season. From New Mexico south, July through early September is the best time to plant. It is important to remember that valuable moisture escapes when you work a seedbed just prior to planting. With mixtures of cool and warm season species, use warm season dates unless cool seasons are the dominant species desired.

In the mountainous high altitude areas, generally seed as soon as possible after a disturbance, but, at least 30 days before frost. Fall dormant seedings are also good at high elevations.

Irrigated seeding dates are more flexible and can be adapted to availability of water and time of season. Weeds should be controlled on all new seedings.

For more specific seeding date information, please refer to the species information pages or USDA Natural Resources Conservation Service, VegSpec website, and State Seeding Specifications. Information can be obtained from local offices.

Soil Texture Classifications Used

Light Texture	Medium Texture / Loams		Heavy Texture	
Sand	Sandy	Silty	Clayey	Clay

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GRASSES

Common Name		Scientific Name	Past Scientific Name	Page No.
Alkaligrass	Weeping	<i>Puccinellia distans</i>	<i>Puccinellia distans</i>	9
Bentgrass	Colonial	<i>Agrostis capillaris</i>	<i>Agrostis tenuis</i>	10
Bentgrass	Creeping	<i>Agrostis stolonifera</i>	<i>Agrostis alba</i> var. <i>stolonifera</i>	11
Bentgrass	Redtop	<i>Agrostis gigantea</i>	<i>Agrostis alba</i>	12
Bermudagrass		<i>Cynodon dactylon</i>	<i>Cynodon dactylon</i>	13
Bluegrass	Alpine	<i>Poa alpina</i>	<i>Poa alpina</i>	14
Bluegrass	Annual	<i>Poa annua</i>	<i>Poa annua</i>	15
Bluegrass	Bulbous	<i>Poa bulbosa</i>	<i>Poa bulbosa</i>	16
Bluegrass	Canada	<i>Poa compressa</i>	<i>Poa compressa</i>	17
Bluegrass	Canby	<i>Poa secunda</i>	<i>Poa canbyi/sandbergii</i>	18
Bluegrass	Fowl	<i>Poa palustris</i>	<i>Poa palustris</i>	19
Bluegrass	Glaucous	<i>Poa glauca</i> ssp. <i>glauca</i>	<i>Poa glaucantha</i>	20
Bluegrass	Kentucky	<i>Poa pratensis</i>	<i>Poa pratensis</i>	21
Bluegrass	Rough	<i>Poa trivialis</i>	<i>Poa trivialis</i>	22
Bluegrass	Sandberg	<i>Poa secunda</i>	<i>Poa ampla</i>	23
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Bluestem	Caucasian	<i>Bothriochloa bladhii</i>	<i>Andropogon caucasicus</i>	25
Bluestem	Little	<i>Schizachyrium scoparium</i>	<i>Andropogon scoparium</i>	26
Bluestem	Sand	<i>Andropogon hallii</i>	<i>Andropogon hallii</i>	27
Bluestem	Yellow	<i>Bothriochloa ischaemum</i>	<i>Andropogon ischaemum</i>	28
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Wheatgrass	Beardless	<i>Pseudoroegneria spicata</i> ssp. <i>inermis</i>	<i>Agropyron inerme</i>	73
Wheatgrass	Bluebunch	<i>Pseudoroegneria spicata</i> ssp. <i>spicata</i>	<i>Agropyron spicatum</i>	74
Wheatgrass	Crested	<i>Agropyron cristatum</i>	<i>Agropyron cristatum</i>	75
Wheatgrass	Hybrid	<i>Elymus hoffmannii</i>	<i>Agropyron repens</i> x <i>A.spicata</i>	76
Wheatgrass	Intermediate	<i>Thinopyrum intermedium</i>	<i>Agropyron intermedium</i>	77
Wheatgrass	Pubescent	<i>Thinopyrum intermedium</i>	<i>Agropyron trichophorum</i>	78
Wheatgrass	Siberian	<i>Agropyron fragila</i>	<i>Agropyron sibiricum</i>	79
Wheatgrass	Slender	<i>Elymus trachycaulus</i>	<i>Agropyron trachycaulum</i>	80
Wheatgrass	Streambank	<i>Elymus lanceolatus</i>	<i>Agropyron riparium</i>	81
Wheatgrass	Tall	<i>Thinopyrum ponticum</i>	<i>Agropyron elongatum</i>	82
Wheatgrass	Thickspike	<i>Elymus lanceolatus</i>	<i>Agropyron dasystachyum</i>	83
Wheatgrass	Western	<i>Pascopyrum smithii</i>	<i>Agropyron smithii</i>	84
Wildrye	Altai	<i>Leymus angustus</i>	<i>Leymus angustus</i>	85
Wildrye	Basin	<i>Leymus cinereus</i>	<i>Elymus cinereus</i>	86
Wildrye	Beardless	<i>Leymus triticoides</i>	<i>Elymus triticoides</i>	87
Wildrye	Blue	<i>Elymus glaucus</i>	<i>Elymus glaucus</i>	88
Wildrye	Canada	<i>Elymus canadensis</i>	<i>Elymus canadensis</i>	89
Wildrye	Mammoth	<i>Leymus racemosus</i>	<i>Elymus giganteus</i>	90
Wildrye	Russian	<i>Psathyrostachys juncea</i>	<i>Elymus junceus</i>	91
Wildrye	Virginia	<i>Elymus virginicus</i>	<i>Elymus virginicus</i>	92
LEGUMES				
Alfalfa		<i>Medicago sativa</i>	<i>Medicago sativa</i>	93
Clover	Alsike	<i>Trifolium hybridum</i>	<i>Trifolium hybridum</i>	94
Clover	Red	<i>Trifolium pratense</i>	<i>Trifolium pratense</i>	95
Clover	White	<i>Trifolium repens</i>	<i>Trifolium repens</i>	96
Milkvetch	Chickpea	<i>Astragalus cicer</i>	<i>Astragalus cicer</i>	97
Sainfoin		<i>Onobrychis viciaefolia</i>	<i>Onobrychis viciaefolia</i>	98
Sweetclover	Yellow	<i>Melilotus officinalis</i>	<i>Melilotus officinalis</i>	99
Trefoil	Birdsfoot	<i>Lotus corniculatus</i>	<i>Lotus corniculatus</i>	100

NOTES

ALKALIGRASS (WEEPING)

Puccinella distans



ORIGIN AND DESCRIPTION

Native to the Western and Northeastern U.S., the Great Plains, New Mexico to Canada. A cool-season, low-growing, erect, perennial bunchgrass. Panicle seed heads are semi-prostrate feathery with a tan appearance. Culms 1 to 1 1/2' tall and form a loose matted turf. Leaves are narrow and dark green. Associated with alkali sacaton on moist saline and alkali soils in the central Great Plains.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Adapted to a wide range of soils and climactic conditions. Grows in clay, clay loam to sandy soils. Often found in pure stands on alkali soils.

Has the ability to establish on salty soils. Will tolerate wet soils and adapted with 16" ppt. Begins growth in May and June and continues through the summer. Good cold tolerance.

CULTURE

Drill seed about 1/2" deep in pure stands at a rate of 2 to 3 lbs. PLS per acre in a firm seedbed. Plant March to April in the central Great Plains, earlier in southern Great Plains and June to July 15th in the Southwest; often seeded in winter months with emergence expected with rising soil temperatures. Keep surface moist during first 3 to 4 weeks. Better establishment with protective cover of standing stubble or mulch.

USE AND MANAGEMENT

Suited for reclamation, roadside stabilization, fairway roughs, and turf on heavy saline-alkali soils. It is generally crowded out on neutral and acid soils by other species such as Kentucky Bluegrass and Tall Fescue. Ideal for ground cover on saline and alkali soils.

Can be cut at a 1/2" height for dense upright stands and playable fairways or 2" height for golf course roughs, landscaping and home lawns. Can be used in mixtures with fescue and bluegrass species for extra fine turf.

Has excellent persistence along road shoulders where salt hazard exists. Also adapted where low quality water or waste effluent is utilized.

IMPROVED VARIETIES

'Fults' released from Colorado

COLONIAL BENTGRASS

Agrostis capillaris



ORIGIN AND DESCRIPTION

Introduced from Europe, widely naturalized in U.S. Cool-season, stoloniferous grass, 6 to 16" tall. Densely tufted, short stolons, dense sod-forming. Fine-textured, short, green to dark leaves, mostly basal. Inflorescence an open panicle, pyramid or cone-shaped. Abundant short stolons. No rhizomes.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Thrives in moist, cool, temperate climates, fertile sandy to clayey alluvial soils high in organic matter. Survives, but low growth on sands, dense clays, and thin soils. Weak tolerance of acid and wet soils. Well adapted to the northeastern

region and northern Pacific Coast. Some varieties have good cold tolerance, but generally used most in south and southeastern U.S.

CULTURE

Drill no deeper than 1/4" on heavier soils and 1/2" on lighter textured soils. Often broadcasted and rolled or cultipacked to press seed into surface soil. Supplemental mulch improves stand establishment. Seeding about 1 to 2 lbs. PLS per acre for erosion control or 1 to 2 lbs. seed per 1,000-sq. ft. for turf. Weak seedling vigor; need to keep moist. Consider sod transplanting where early cover is needed.

Plant in August to September for humid lowland elevations, or in early spring, especially when a legume is included in mixture. Commonly seeded alone or in mixtures with Blue Grasses (*Poa* spp.) and Clovers (*Trifolium* spp.) and other turf grasses.

USE AND MANAGEMENT

Used for lawns, golf course fairways, landscaping, and erosion control. Good with other turf grasses and clovers for grasslands or landscaping around industrial sites; also used in mountain, northern Great Plains, and cornbelt waterways. Tolerates moderate winter flooding, high water tables, or poor drainage.

IMPROVED VARIETIES

Six strains or cultivars are listed in the 1994 Grass Varieties of the United States, USDA SCS Handbook 170. Turf type varieties are also available. Consult with state or local plant materials specialists for varieties best adapted to specific sites and purposes.

CREEPING BENTGRASS

Agrostis stolonifera



ORIGIN AND DESCRIPTION

Introduced from Europe; widely naturalized in the U. S. Cool season, stoloniferous grass, 6 to 16" tall. Densely tufted and turf-forming, fine-textured, short green leaves, mostly basal. Inflorescence an open panicle, pyramid, or cone shaped. Abundant short stolons.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Thrives in moist, cool, temperate climates, fertile

sandy to clayey alluvial soils high in organic matter. Survives, but low growth on sands, dense clays, and thin soils. Weakly tolerant of acidic and salty soils. Adapted on wet soils but intolerant of prolonged flooding, high water tables, or poor drainage.

CULTURE

Drill no deeper than 1/4" on heavier soils and 1/2" on lighter textured soils. Often broadcasted and rolled or cultipacked to press seed into surface soil. Supplemental mulch improves stand establishment. Seeding about 0.5 to 1 lbs. PLS per acre for erosion control, or 0.5 to 1 lbs. seed per 1,000-sq. ft. for turf. Weak seedling vigor. Need to keep moist. Consider sod transplanting where early cover is needed.

Plant in August to September for humid lowland elevations, or in early spring, especially when a legume is included in mixture. Commonly seeded alone or in mixtures with Blue Grasses (*Poa* spp.) and Clovers (*Trifolium* spp.) and other turf grasses.

USE AND MANAGEMENT

Used for lawns, fairways, putting greens, and erosion control. Planted on putting greens throughout much of the U.S. Good with other turf grasses and clovers for amenity grasslands or landscaping around industrial sites. Also used in mountain, Northern Great Plains, and combelt waterways. Good cold and winter hardiness.

IMPROVED VARIETIES

Eleven strains or cultivars listed in 1994 Grass Varieties of the United States USDA SCS Handbook 170. Consult with state or local plant materials specialists for varieties best adapted to specific sites and purposes.

REDTOP BENTGRASS

Agrostis gigantea



ORIGIN AND DESCRIPTION

Native to Europe, introduced as a cultivated species. Naturalized in the more humid areas of the U.S., especially in northeastern and north central regions. Cool season, strong rhizomes, perennial sod grass with decumbent to semi erect culms 1 to 4' tall. Leaves are harsh and seed head is a purplish-red loose panicle.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Thrives best on moist to semi-wet soils. No marked soil textures limitation when moisture is abundant, otherwise best on clay loam and loam

soils. Tolerant of moderately acidic and nutritionally poor soil. Not suited for planting on limey soils or on limestone sites. Mostly in mountain meadows and subalpine grasslands with openings in canopy cover. Adapted on poorly drained acid soils.

CULTURE

Seed no deeper than 1/2", preferably shallower on finer textured and moist soils. Cover broadcasted shallow or seed may be pressed into soil with a cultipacker. Rates for drill seeding 4 to 5 lbs. PLS per acre. Commonly used 8 to 10 lbs. per acre, adequate for broadcasting seeding with poor seedbeds and harsh sites. Seeding time usually early spring, late fall, early fall, or in June or July, later dates for higher mountain areas.

USE AND MANAGEMENT

Species seeded for pastures, meadows, turf and occasionally for hay. Also used for waterways, and ditch bank cover. Seeded in burned or cut over timberlands and to retard weed invasion in wet lowlands. Use to revegetate acid mine spoils. Good palatability for livestock in spring and early summer. Fair palatability after headed but poor in winter. Good grazing resistance. Quick cover species on game range restoration and disturbed land.

Species starts growth early to mid-spring, varying with latitude and altitude, matures in mid to late summer and makes fair volume of fall regrowth in wet sites. Tolerant of semi-shaded environments.

Redtop and Alsike Clover make a good mixture for wet meadows and subirrigated sites. Moderately competitive, but maybe slightly too aggressive for weaker turf species.

IMPROVED VARIETIES

'Streaker' released by Jacklin Seed Co. Idaho

'Dominant Extreme'

BERMUDAGRASS

Cynodon dactylon



ORIGIN AND DESCRIPTION

Introduced from Africa in late 1700's. Major warm season, sod-forming grass of the southern states, Western Great Plains and Southwest. Dense tufted, commonly 6 to 24" tall with gray-green basal leaves.

Interspecific hybridization of several species has been an important factor in the development of improved varieties of Bermuda for both turf and pasture use.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Best adapted to relatively fertile soils in the humid Southeastern states but also grows in southern part of the central corn-belt states. Giant Bermudagrass, found in the irrigated areas in the Southwest, appears to be diploid form of *C. dactylon*; is distinguished from common Bermuda by greater vigor and lack of pubescence.

Bermuda varieties are adapted in clayey to sandy well-drained soils. Tolerates soil salinity and commonly persists on alkaline soils. Good drought tolerance, adapted to hot summer temperatures.

CULTURE

Drill seed 1/4 - 1/2" deep on firm seedbed or broadcast about same depth. Better establishment in protective cover of non-volunteering crop, stubble, or mulch. Plant 11 to 23 lbs. PLS per acre. Plant April to mid-May in central Great Plains, slightly earlier in southern Great Plains and June 15 to July 15 in Southwest. Control weeds and protect from grazing until plants well rooted and seed heads produced.

Some turf varieties are only propagated vegetatively.

USE AND MANAGEMENT

Widely used for pasture, lawns, general-purpose turf, and erosion control. Occasionally used for hay. Some varieties withstand foot traffic very well. Selected varieties are cold tolerant in southern Oklahoma. Forage types have been selected for use in the south.

May be grazed continuously all summer or all year long if not overgrazed. However, it should be grazed every 4 to 5 weeks or forage quality tends to drop after 6 weeks.

IMPROVED VARIETIES

Thirty-eight strains or cultivars listed in 1994 Grass Varieties of the United States USDA SCS Handbook 170. Consult with state or local plant materials specialists for varieties best adapted to specific sites and purposes.

ALPINE BLUEGRASS

Poa alpina



ORIGIN AND DESCRIPTION

Native to mountainous areas. Grows in the cooler and high elevation regions of the U.S. Short erect bunchgrass, culms 8 to 24" tall, arising from a tight crown and short leaf blades. Occurs in Colorado, Utah, Washington, and Oregon. Flowering head is panicle 1 to 2" long.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Cold tolerant, occurring in the alpine and sub-alpine zones. Common in mountain meadows, bogs, and wet places. Naturally colonizes in open or disturbed sites in western mountains. Also grows on relatively well-drained soils and grassy slopes.

Associated with other moisture loving plants such as Alpine Timothy, Meadow Sedges and Rushes, Redtop and Willows.

CULTURE

Plant seed 1/4 - 1/2" deep on coarsely textured soils and 1/4" or shallower on fine-textured soils. Better stands obtained on firm seedbed. Drill about 1 to 2 lbs. PLS per acre for satisfactory stands. Increase rate 50 - 100% for harsh sites, steep open exposures, poorer seedbeds and when broadcasting. Plant seed as soon after disturbance as possible in mountain environment. Mulching is recommended. Protect new seeding from grazing.

USE AND MANAGEMENT

Used in seeding mixtures for erosion control, reclamation, and restoration in alpine and sub-alpine region. Adapted for use on big game ranges and to protect roads, ski slopes, and mined lands. Will establish on gravelly alpine slopes.

IMPROVED VARIETIES

'Gruening' released from Alaska

ANNUAL BLUEGRASS

Poa annua



ORIGIN AND DESCRIPTION

Introduced from Europe, and has become naturalized over most of the U.S. Invades lawns and turf grasses. Small, annual, cool season tufted bunchgrass. Plants 1 to 8" tall with panicle head 1 to 2" long. Sometimes growing in water, plants will become taller and slender.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Growth begins in the fall or early spring and blooms very early. Some blooming occurs in the fall. Plants often found on dry shallow soils. Makes the most growth where fall moisture is available. May die out with hot weather.

CULTURE

Plant seed 1/4 - 1/2" deep on coarse textured soils and 1/4" or shallower on fine-textured soils. Plant at 1 to 2 lbs. PLS per acre. Good seedling vigor and early growth.

USE AND MANAGEMENT

Used for lawns, paths, along streams, and roadsides. Tolerates close mowing and produces seed under regular mowing height of 1/2". Under cool conditions, volunteer stands provide good to fair turf. May be useful as fall and spring cover in Bermuda Grass fairways. Over seed for green cover during winter in the south.

IMPROVED VARIETIES

Plant breeders are working on selecting more useful and desirable varieties of annual bluegrass.

BULBOUS BLUEGRASS

Poa bulbosa



ORIGIN AND DESCRIPTION

Introduced from Europe. Small, spring dominant, cool season, Bunchgrass. Plants 1 to 12" tall. Naturalized over extremely wide area of northwest U.S. below 4,000' elevation.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Often occurs on dry shallow soils associated with Cheatgrass. Reproduces by bulblets formed on the head in place of seed. The base is bulbous and may live for several years in a dormant

state. Makes the most growth where early fall and winter moisture is available. Fall growth stops with freezing weather, but starts again early in the spring. Plants set seed early June and remain dormant until fall.

CULTURE

Increased from bulblets that form in panicle. Plant about 3 to 6 lbs. PLS seed (bulblets) per acre. Early spring or late fall planting. Protect from grazing and control weeds.

USE AND MANAGEMENT

Used for pasture and erosion control in humid parts of northern U.S., including southwestern Idaho, Oregon, and Northern California. Adapted as a self-perpetuating cover crop on dryland areas. Should not be planted at higher elevations or near winter heat ground. A good understory grass for range seedings because it provides excellent ground cover and competes with Cheatgrass and other early growing weeds. Fall, winter, and spring forage for livestock.

IMPROVED VARIETIES

None listed for region

CANADA BLUEGRASS

Poa compressa



ORIGIN AND DESCRIPTION

Introduced from Eurasia and naturalized in disturbed areas in Kentucky Bluegrass range. Grows in more open, bunchy sods than Kentucky Bluegrass. Low growing rhizomatous perennial grass; has distinctly flat stems, short blue green to dark green leaves, head is a short condensed panicles.

GROWTH HABIT AND ENVIRONMENT PREFERENCE

Thrives in moist, cool, temperate climates, fertile sandy to clayey alluvial soils high in organic matter. Tolerates moderately acid, drought, and thin soil in sites with over 15" ppt. in northeastern and western mountains regions. Adapted to open, rather poor, dry soils.

CULTURE

Drill no deeper than 1/2" on heavier soils or 1/4" on lighter textured soils. Often broadcasted and rolled or cultipacked to press seed into surface soil. Supplemental mulch improves stand establishment. Seeding about 0.5 to 1 lb. PLS per acre forage or 1 to 2 lbs. seed per 1,000-sq. ft. for turf. Need to keep moist for establishment. Consider sod transplanting where early rapid cover is desired.

Plant in early fall (August to September) or early spring for humid lowland elevations, late fall, especially when a legume is included and soils not subject to crusting.

USE AND MANAGEMENT

Used for low maintenance landscaping, stabilization of disturbed soils, and in pasture mixtures on poorer sites not suited to higher producing pasture species. Does not withstand heavy grazing. Sometimes used in Ohio and Illinois coal districts for reclamation of coalmines.

IMPROVED VARIETIES

- 'Rubens' released by Jacklin Seed Co
- 'Canon' released from Canada
- 'Talon' released from Canada
- 'Foothills' released from Montana

CANBY BLUEGRASS

Poa secunda



ORIGIN AND DESCRIPTION

Native to western U.S., Rocky Mountain, and Northern Great Plains region. Short, cool season, Bunchgrass. Small and densely tufted, culms 8 to 16" tall, typically under 12" tall. Leaves short and mostly basal blades folded or involute and soft with boat-shaped tips. Panicles yellowish, short, narrow-contracted. Shallow or sometimes deep, finely branched, fibrous root system.

GROWTH HABIT AND ENVIRONMENTAL PREFERENCES

Adapted to all soil textures, often a primary native in shallow, rocky, and droughty soils. Adapted to weakly acid, alkaline, and saline soils. Intolerant of prolonged flooding and high water tables but occurs on imperfectly drained sites saturated briefly in spring. Species are scattered from low altitude cold deserts and plains to alpine elevations. Local sources of native seed, cold tolerant and winter-hardy. Avoid using seed from habitats differing greatly.

Moderately shade tolerant and fire tolerant when dormant. Seedlings weakly competitive but plants compatible and competitive when fully established, often self-seeding and filling in bare spaces and suppressing weedy Cheat-grass invasion.

CULTURE

Drill on well-prepared and firmed seedbeds at 1/2" - 1/4" depths. Plant 1 to 2 lbs. PLS per acre. Use 1 to 2 lbs. PLS per 1,000-sq. ft. for turf grass. Double seeding rate when broadcasting for harsh, dry, and erosive sites. Seed early spring at higher elevations. Late fall suggested for Pacific Northwest and Intermountain States. Seedling vigor may be weak, requires weed control and protect from grazing during establishment period.

USE AND MANAGEMENT

Used as low maintenance turf and forest roads in Northern Great Plains and Rocky Mountains. Low volume forage and seed producer, makes growth in early spring, poor volume of summer regrowth and fair volume in fall. Good palatability while green, moderately used by elk and deer. Growth starts in early spring ahead of native cool season species and matures in early summer or later at high mountain elevations, becomes dormant in summer and renews growth with fall rains. Good grazing tolerance due to short growth form and early maturity behaves as an increaser on most rangelands and may dominate overgrazed Sagebrush-grass and deep soils of the northern prairie communities.

Canby Bluegrass is similar to Sandberg Bluegrass but is taller, more vigorous, longer leaved, later maturing, and more productive. Occurs intermixed with Sandberg Bluegrass on more favorable sites. Canby is distinctly superior to Sandberg Bluegrass in production.

IMPROVED VARIETIES

'Canbar' released from Idaho and Oregon

'Service' released from Alaska

'Opportunity" germplasm release Montana

FOWL BLUEGRASS

Poa palustris



ORIGIN AND DESCRIPTION

Native to the U.S. and Eurasia. Widely distributed in U.S. Grows in meadows, stream banks and moist areas in northern U. S., south to New Mexico and California. Short to medium height, 1 to 2' tall. Cool season, dense sod-forming perennial grass. Densely tufted growth with shallow, abundant, widely spreading rhizomes. Leaves dark green mostly basal and soft textured. Inflorescence an open panicle, pyramid, or cone shaped.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Thrives in moist, cool, temperate climates; grows at low and medium elevations. Prefers fertile sandy to clayey alluvial soils high in

organic matter. Needs about 18" ppt. or irrigation for good performance. Good cold and winter hardiness.

CULTURE

Drill no deeper than 1/4" on heavier soils and 1/2" on lighter textured soils. Often broadcasted and rolled or cultipacked to press seed into surface soil. Supplemental mulch improves stand establishment. Seeding about 1 to 2 lbs. PLS per acre forage or 1 to 2 lbs. seed per 1,000-sq. ft. for turf. Weak seedling vigor; need to keep moist. Consider sod transplanting where early cover is needed.

Plant in August to September for humid lowland elevations; early spring alone or in mixtures with turf grasses for landscaping, lawns, greens or soil stabilizing.

USE AND MANAGEMENT

Good cover for lawns and landscaping on wet sites. Moisture and nitrogen needed for good production.

IMPROVED VARIETIES

None listed for region

GLAUCOUS BLUEGRASS

Poa glauca ssp. *glauca*



ORIGIN AND DESCRIPTION

Introduced from Turkey and naturalized in many disturbed areas throughout the Great Plains. Low growing, loosely tufted perennial Bunchgrass that spreads by tillering. Has weak rhizomes. Leaves numerous, flat, short, well-distributed, dark green. Shorter panicle seed head numerous, lax, becoming brownish, compact and nodding at maturity.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Grows on silty loams to clayey shallow to deep soils with over 18" ppt. Stands do well on roads, ditch banks providing an attractive and effective groundcover.

CULTURE

Drill no deeper than 1/4" on heavier soils or 1/2" on lighter textured soils. Often broadcasted and rolled or cultipacked to press seed into surface soil. Supplemental mulch improves stand establishment. Seeding about 0.5 to 1 lbs. PLS per acre for forage, or 1 to 2 lbs. seed per 1,000-sq. ft. for turf. Need to keep moist for establishment. Consider sod transplanting where early cover needed.

Plant in early spring or August to September for humid lowland elevations or fall or in early spring especially when a legume is included in mixture.

USE AND MANAGEMENT

Used for ground cover and turf on low fertility soils. Adapted for revegetation, low maintenance landscaping, and stabilization of disturbed soils. Also in pasture mixtures on poorer sites not suited to more productive pasture species. Plant resembles Canada Bluegrass but less readily sod-bound, lodges less and produces more seed. Established stand requires little maintenance.

IMPROVED VARIETIES

'Draylar' released from Washington

'Tundra' released from Alaska

KENTUCKY BLUEGRASS

Poa pratensis



ORIGIN AND DESCRIPTION

Introduced from Europe widely naturalized in U.S. Short to medium height, cool season, and dense sod forming perennial grass. Densely tufted and turf forming with shallow, abundant, widely spreading rhizomes. Leaves dark blue, mostly basal, soft textured. Inflorescence an open panicle, pyramidal or conical shaped.

GROWTH HABIT AND ENVIRONMENT PREFERENCES

Thrives in moist, cool, temperate climates, fertile sandy to clayey alluvial soils high in

organic matter; likes soils of limestone origin. Survives, but low growth on sands, dense clays, and thin, rocky moisture soils. Weakly tolerant of acid, and salty soils.

CULTURE

Drill no deeper than 1/4" on heavier soils and 1/2" on lighter textured soils. Often broadcasted and rolled or cultipacked to press seed into surface soil. Supplemental mulch improves stand establishment. Seeding about 1 to 2 lbs. PLS per acre forage or 1 to 2 lbs. seed per 1,000-sq. ft. for turf. Weak seedling vigor, need to keep moist. Consider sod transplanting where early cover is needed.

Plant in early fall (August to September) for humid lowland elevations, early spring, especially when a legume is included in mixture. Commonly seeded alone or in mixtures with Bentgrass (*Agrostis* spp.) and Clovers (*Trifolium* spp.) and other turf grasses for landscaping, lawns, greens or soil stabilizing.

USE AND MANAGEMENT

Good with other turf grasses, golf greens, and covers for amenity grasslands or lawns and landscaping around industrial sites. Palatable to most grazing animals, excellent grazing tolerance and good fall regrowth. Moisture and nitrogen needed for good production. Intolerant of prolonged flooding, high water tables, or poor drainage. Naturalized from near sea level to the alpine edge of the Rocky Mountains about 18" ppt. or irrigation for good performance. Moderate shade tolerance. Good cold and winter hardiness.

IMPROVED VARIETIES

Seventy-four strains or cultivars listed in [1994 Grass Varieties of the United States, USDA SCS Handbook 170](#). Consult with state or local plant materials specialists for varieties best adapted to specific sites and purposes.

ROUGH BLUEGRASS

Poa trivialis



ORIGIN AND DESCRIPTION

Introduced from Europe as a lawn grass for shady areas, distributed in the northern U.S. Short to medium height, cool season, sod forming perennial grass. Densely tufted and turf growth with abundant, widely spreading rhizomes. Leaves dark green, mostly basal and fine-textured. Inflorescence an open panicle.

GROWTH HABIT AND ENVIRONMENT PREFERENCES

Thrives in moist, cool, temperate climates, not adapted to dry sites. Grows best in fertile sandy

to clayey alluvial soils high in organic matter. Weakly tolerant of acid, and salty soils.

CULTURE

Drill no deeper than 1/4" on heavier soils and 1/2" on lighter textured soils. Often broadcasted and rolled or cultipacked to press seed into surface soil. Supplemental mulch improves stand establishment. Seeding about 1 to 2 lbs. PLS per 1,000-sq. ft. for turf. Need to keep moist. Consider sod transplanting where early cover is needed.

Plant in early fall (August to September) for humid lowland elevations or early spring. Commonly seeded alone or in mixtures with other turf grasses for landscaping, lawns, greens or soil stabilizing.

USE AND MANAGEMENT

Good with other turf grasses, lawns and landscaping around industrial sites. Some varieties selected for use on putting greens. In southern U.S. used for over-seeding in mixtures and component in shade mixtures often with perennial ryegrass and fine fescues. Over-seed during summer in northern climates and over-seed Bermuda Grass in winter in southern climates and in open sun. Needs about 24" ppt. or irrigation for good performance. Good shade and cold tolerance. Dormant during summer months.

IMPROVED VARIETIES

- 'Colt' released by PST and Pickseed West Inc.
- 'Cypress' released from Germany
- 'Polder' released by Mommersteeg International
- 'Sabre' released by International Seed

SANDBERG BLUEGRASS

Poa secunda



ORIGIN AND DESCRIPTION

Native to the Intermountain West, medium-sized, basal-leaved, cool season Bunchgrass. Culms 2 to 4' tall, green to blue-green, smooth, basal leaves 8 to 16" long. Leaf blades narrow, folded, elongated with boat-shaped tips. Inflorescence a narrow, elongated panicle, up to 8" long. Sometimes with short rhizomes, but typically densely tufted. Strong fibrous root system but immature plants and seedlings easily uprooted.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Thrives on moderately coarse sandy to fine clayey soils, tolerant of weakly alkaline and acid

soils. Weak tolerance to early spring flooding and poor drainage. Thrives in 12 to 15" ppt. but nearly equal performance in better moisture sites of 15 to 20" ppt. Moderate drought tolerance compared to cool season species. Excellent cold tolerance of local ecotypes. Growth very early in spring, earlier than crested wheatgrass; matures in early summer with moisture exhaustion or later in summer with abundant moisture at higher elevations.

It occurs from foothill to subalpine elevations. Moderate shade and grazing tolerance. Intolerant of dry season wildfires.

CULTURE

Drill seed about 1/4 - 1/2" inch deep for medium-textured soils with average moisture conditions or slightly deeper on coarser and drier soils. Cover broadcast seed very shallow. Drill 1 to 3 lbs. PLS per acre. Seed in early spring before most favorable conditions for rapid germination and seedling growth late fall, or as early as possible in summer for higher mountain.

Seedling vigor is moderate. Stands may be ready for grazing by the second fall with moderately good moisture conditions. Seedlings and immature plants are easily pulled up by grazing. Usually grazing must be withheld for two growing seasons to avoid stand losses from "pull-up".

USE AND MANAGEMENT

Used for hay and early spring forage for livestock. Good palatability to livestock, elk and deer, spring and fall; also good forage in summer at higher elevations. Seed alone or in mixtures with Alfalfa and sometimes with other species for pasture and hay both dryland, and irrigated. New seedings require weed control during first season.

IMPROVED VARIETIES

'Sherman' released from Oregon
'High Plains' released from Montana
'Reliable' germplasm ARS Utah

BIG BLUESTEM

Andropogon gerardii



ORIGIN AND DESCRIPTION

Native to most areas east of Rocky Mountains and primary species of Tall Grass Prairie of Midwest. Tall, long-lived, warm season, bunchy sod former. Grows 3 to 6' tall, reddish purple at maturity. Thick rhizomes, 3 to 6" long. Numerous long basal and stem leaves green to dark green, often tinged with purple. Inflorescence a 2 to 6 branched turkey foot-shaped raceme. Freely inbreeds with Sand Bluestem.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Thrives on rich fertile silt and clay loam soils of lowlands, draws and ravines in overflow and

subirrigated sites in the 20 to 30" ppt. the belt of central U.S. Moderate salinity tolerance. Moderate fertility requirements. Tolerates short-term submergence but prefers good drainage. Good winter hardiness.

CULTURE

Drill seed at 1/4 - 3/4" deep on fine to moderately coarse soils to 1" in sands on prepacked seedbeds. Cover broadcast seed shallow. Plant 6 to 12 lbs. PLS per acre and 50 - 100% more seed on erosive sites or broadcasting. Seed in non-volunteering crop stubble for better stands on erosive sites. Seed hay seeding sometimes feasible. Can be sod transplanted on critical sites. Seed March, April in southern and April, May in northern Great Plains. Can be seeded in winter but may get erratic stands.

USE AND MANAGEMENT

Used for pasture, hay, landscaping, prairie chicken cover and wildlife habitat. Used for warm season irrigated pasture and hay. Graze established stands moderately leaving at least 6" stubble in summer. Late spring burning will remove old herbage and make for more uniform new growth. Highly palatable from late spring until fall. Tends to increase with good management.

IMPROVED VARIETIES

- 'Pawnee' released from Nebraska
- 'Kaw' released from Kansas
- 'Champ' released from Nebraska
- 'Bison' released from North Dakota
- 'Bonilla' released from North Dakota
- 'Roundtree' released from Missouri
- 'Sunnyview' released from South Dakota
- 'Bounty' germplasm release from North Dakota

CAUCASIAN BLUESTEM

Bothriochloa bladhii



ORIGIN AND DESCRIPTION

Introduced from U.S.S.R. Medium-sized, warm season Bunchgrass. Mostly erect, 24" tall without rhizomes or stolons. Light green narrow leaf blades. Foliage turns reddish-brown when mature. Inflorescence dark reddish. Contrastingly different to Yellow Bluestems and Old World Bluestem (*Bothriochloa intermedia*).

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Adapted to moderately fertile, loamy and clayey textured soils, but not too good on less productive

sandy and clayey eroded soils. Winter hardy from east central Colorado and northern Kansas throughout the southern Great Plains on suitable sites and on to South Texas. Adapted to 16 to 30" ppt. areas with 20" most optimal. Stays green through seasonal drought. Tolerant of weakly saline soils and grown on weakly basic to weakly acid soils. Good fire tolerance in dormant state.

CULTURE

Drill seed 1/4 - 1/2" deep or cover shallow if broadcast seeded. Needs firm seedbed. Plant March 15 - May 15, drill seed 3 to 7 lbs. PLS per acre on non-irrigated areas. May need more seed on broadcast or harsh sites where immediate dense cover is desired or needed. Drilling into non-volunteering crop stubble or using supplemental mulch will improve stand establishments. Adapts to row crop culture, fertilization and management similar to lovegrasses.

USE AND MANAGEMENT

Used to limited extent in central and southern Great Plains for range and pasture, and for soil conservation of eroding fields and roadsides. Provides dense foliage for good upland bird cover. Moderately close grazing recommended on established stands to maintain usable herbage quality and good livestock performance. Not too desirable in some mixtures because of lower palatability. Responds well to fertilization. Needs intensive management to sustain high production. Good fire tolerance in dormant state.

IMPROVED VARIETIES

'KG-40' tested from Kansas

LITTLE BLUESTEM

Schizachyrium scoparium



ORIGIN AND DESCRIPTION

Native to U.S. and widely distributed across the U.S. Primary species of Midwestern prairies. Warm season, long-lived, perennial Bunchgrass. Erect large growth, 1 to 4' tall, largely tufted with occasional short rhizomes. Light blue-green when young, reddish brown when mature. Deep fibrous root system. Semi-sod forming in sub-humid zones and sites.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Resumes growth in spring, heads develop in late summer and matures in fall. Tolerant to wide range of sandy and clayey soils with adequate soil moisture. Silty soils optimal. Common on

sandy and sands range sites. Not adapted to wetlands and saline subirrigated sites. Best stands on limey uplands in Nebraska and on calcareous soils from limestone in southern U.S. Low to fair fertility requirements. Grows in 10 to 20" ppt. areas optimal at 15 to 20" ppt. from 1,000 to 7,500' elevation.

CULTURE

Drill 1/4 - 1/2" deep on finer soils and 3/4" on coarse soils on prepacked or otherwise firm seedbeds soil, topsoil, or supplemental mulches are recommended for bare, eroded and disturbed sites. Use 3.5 to 7 lbs. PLS per acre seeding rate. If broadcast seeded double the seeding rate. Plant in March or April in southern and April or May in central and higher western Great Plains areas. Control weeds by grazing, herbicides, or clipping.

USE AND MANAGEMENT

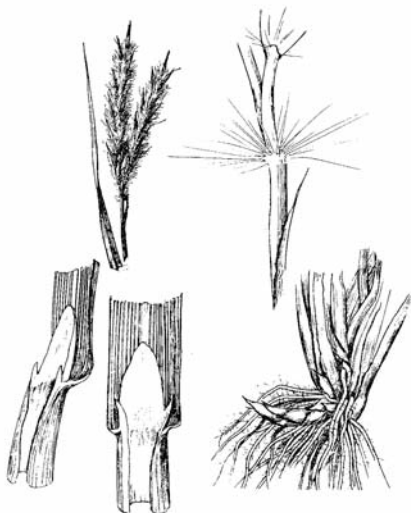
Used for hay, pasture, game cover and landscaping. Seeded in conservation projects including, eroded fields, roadsides, gullies and prairie restoration. Often used in mixtures with other species in prairie restoration projects such as: Big Bluestem, Sideoats Grama, and others. Most palatable in early grazing season and throughout summer. Not palatable in winter to cattle. May be burned in late spring on damp soil. Consider wildlife in total management plan.

IMPROVED VARIETIES

- 'Aldous' released from Kansas
- 'Blaze' released from Nebraska
- 'Camper' released from Nebraska
- 'Cimarron' released from KS and OK
- 'Pastura' released from New Mexico
- 'Itasca' released from North Dakota

SAND BLUESTEM

Andropogon hallii



ORIGIN AND DESCRIPTION

Native to U.S. along the eastern edge of the Great Plains from North Dakota to eastern Texas. Sand Bluestem is very similar to Big Bluestem and distinguished by conspicuous hairs on panicle, shorter awns, bluer foliage (not as reddish or reddish purple), strongly rhizomes and greater lateral spread. Sand Bluestem is a warm season, long-lived, perennial sod grass.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Similar to Big Bluestem except used more in conservation of sandy soils and sites than for other purposes. Adapted to sandhills and sand prairies in the Great Plains. Has deep roots, short rhizomes, and some lateral spread.

CULTURE

Similar to Big Bluestem. Drill 1/4 - 1" deep on fine to moderately coarse soils to 1 1/2" in sand.

Cover broadcast seed shallow. Plant 8 to 16 lbs. PLS per acre 50 - 100% more on erosive sites or broadcasting. Seed in non-volunteering crop stubble for better stands on erosive sites, 'seed hay', seeding is often feasible and can be sod transplanted on critical sites. Seed March-April in southern and April-May in northern Great Plains. Can be seeded in winter but may get erratic stands. Several options of controlling weeds in new seedings-herbicides, controlled grazing and mowing.

Consider seed hay and sod transplant methods of establishment for critically disturbed sites. Protect from grazing.

USE AND MANAGEMENT

Valuable on deep sandy soils from central Northeast into eastern Colorado and south into New Mexico and Oklahoma. Used in protecting highly eroded areas and to some extent for hay and grazing. Often seeded in mixtures to revegetate and reclaim disturbed sandy sites, including "blowouts" in dunes. Used for forage, landscaping, prairie chicken and wildlife cover. Graze established stands moderately leaving at least 6" stubble in summer. Late spring burning will remove old herbage and make for more uniform new growth.

IMPROVED VARIETIES

- 'Elida' released from New Mexico
- 'Garden' released from Nebraska
- 'Woodward' released from KS and OK
- 'Goldstrike' released from Nebraska
- 'Centennial' released from Kansas
- 'Chet' released from Kansas
- 'Cottle Country' germplasm from Kansas

YELLOW BLUESTEM

Bothriochloa ischaemum



GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Rather widely adapted over New Mexico, Oklahoma, Colorado, and parts of Texas, Arizona, Utah and Kansas. Does well in a wide range of soils from loamy sands to clays. Some varieties are rather winter-hardy and drought-resistant. Good forage production.

CULTURE

Drill 1/4 - 3/4" deep on fine soils and up to 1" deep on coarser or prepacked sandy soils. Plant from 1 to 2 1/2 lbs. PLS seed per acre depending on stand desired. May be planted from March-April in most areas of Great Plains where adapted. May also be planted in winter months to come up as soil temperatures warm up. Control weeds especially in new seedings.

USE AND MANAGEMENT

Used for pasture and hay with wide spread distribution. Makes large tonnage of good quality hay if harvested at the proper time. Also used in conservation, soil stabilization and revegetation on depleted soil or rangelands. May be grazed rather heavily and is usually highly palatable when green.

IMPROVED VARIETIES

- 'El Kan' released from Kansas
- 'Ganada' released from New Mexico
- 'Plains' released from Oklahoma
- 'King Ranch' released from Texas
- 'W.W. Sparr' released from Oklahoma
- 'W.W.IronMaster' released from Oklahoma
- 'Old World T587' released from Texas
- 'WW-B.DAHL' released from Texas

ORIGIN AND DESCRIPTION

Introduced from former USSR, China, Turkey and India for pasture in Texas and Oklahoma. Grown in the warmer areas of the Southwest. Warm season perennial Bunchgrass, 2 to 5' tall, with pale-yellow stems. Tends to form large clumps varying somewhat with variety. Leaves mostly basal, 10 to 12" long, and light green. Heads paniced, sometimes almost fan-shaped on ends of a long stalk.



PLAINS BRISTLEGRASS

Setaria vulpiseta



ORIGIN AND DESCRIPTION

Native to the U.S. Grows in Arizona, Texas, Oklahoma and north to New Mexico and Colorado. Warm-season, perennial bunchgrass 1 to 3' tall with rather wide leaves and narrow spike-like panicle heads 3 to 5" long with stiff hairs that extend from within the seeds.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Occurs mostly on sandy and sandy loam soils in relatively low ppt. Adapted in areas from 3,000 to 7,000' elevation and is very drought resistant.

Grows on dry plains and along roadsides or other areas protected from grazing. Very early maturing may produce two seed crops per season if rainfall conditions are good (one in the late spring and one in early fall). Good seed producer with a high seed stock to leaf ratio.

CULTURE

Plant 3 to 6 lbs. PLS per acre. Seed 1/2 - 1" deep in April in southern Great Plains areas or May - June in northern Great Plains. May be seeded in fall and winter to germinate as ground warms. Protect new seedlings from grazing until they are well established and rooted.

USE AND MANAGEMENT

Used in conservation, pasture, hay and range mixes. Responds well to irrigation and makes considerable hay and pasture in pure stands. High quality forage when grazed if green and succulent. Becomes strawy after maturity. Grazing must be controlled. Will decrease on ranges that are continuously grazed. In mixtures, manage to protect Plains Bristle Grass. It does not compete well with taller plants that are more aggressive. To maintain plant vigor and produce a seed, defer grazing every 2 to 3 years, 80 to 90 days before seed maturity. Birds relish the seed.

IMPROVED VARIETIES

'Catarina' blend released from Texas

'Stevan' released from Arizona

MEADOW BROME

Bromus biebersteinii



ORIGIN AND DESCRIPTION

Native to southeastern Asia. Introduced forage plant adapted to cool moist areas of the U.S. and Canada. Long-lived, rapidly developing, leafy forage. Plant spreading by short rhizomes (has bunchy appearance). Proliferation of long (1-3') basal leaves. Awned seeds produced on large, open panicle seedhead. Extensive fillers root system.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Adapted to cool moist areas of the U.S. on shallow to deep, coarse to medium textured, moderately well drained soils. Will tolerate moderately

weak saline-alkali soils. About equal to smooth brome for drought tolerance. Adapted to medium elevations, 16 to 20" ppt. Starts spring growth earlier than Smooth Brome and stays greener longer during the summer. Meadow Brome makes rapid recovery after clipping or grazing.

CULTURE

Plant seeds about 1/2" deep using seed 12 to 24 lbs. PLS per acre. Alternate row seeding is recommended for pasture and forage production when seeded with legumes. The seeds germinate rapidly producing strong seedlings and rapidly growing plants. Spring seeding recommended, especially for irrigated seeding, and for soils subject to crusting or frost heaving. Late fall seeding has been satisfactory when made in clean stubble or fallowed seedbed on soils and areas not susceptible to frost heaving. Control weeds with herbicides or by cutting. New seedlings should not be grazed until the plants are fully established.

USE AND MANAGEMENT

Used for quality hay and pasture forage, both irrigated and dryland. It has numerous long lax leaves. Leaves have been measured up to 42" long. Maintain a 6" stubble height for plant vigor. Allows plants to make 10 to 12" growth in the spring prior to grazing. Allow 4 to 5 weeks regrowth between cuttings or grazing. Once established Meadow Brome will withstand heavy grazing and is desirable for lambing, holding area, and other special use pastures. Produces a high volume of good forage.

IMPROVED VARIETIES

'Regar' released from Idaho

'Fleet' released from Canada

'Paddock' released from Canada

'Cache' released from Utah

'MacBeth' released from Montana

'Arsenal' released ARS Utah

MOUNTAIN BROME

Bromus marginatus



ORIGIN AND DESCRIPTION

Native to the intermountain west, northern and central Rocky Mountains. Rapidly developing, short-lived, medium-sized, cool season bunchgrass. Tufted with fibrous, shallow roots. Coarse culms 1 to 4' tall. Inflorescence a narrow open panicle, 4 to 6" long with erect or spreading (not nodding) branches. Freely interbreeds with California Brome (*B. carinatus*) and Foothills Brome (*B. polyanthus*) to form a "Mountain Brome complex."

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Thrives on moderately deep, fertile, moist, medium to fine-textured soils, but moderately

vigorous on thin, infertile, coarser, fairly dry soils, especially in open communities and disturbed sites. Tolerant of fair salinity but intolerant of high water tables and early spring flooding. Vigorous native stands occur in 18" ppt. Has weak moderate drought tolerance. Good winter hardiness. Common in foothills to about 10,000' elevations. Only fair tolerance of wildfires and survives chiefly by seed. Stand longevity of 3 to 5 years, good self-seeding habits. Shade-tolerant species.

CULTURE

Drill seed about 1/2 - 3/4" deep on finer textured soils, up to 1" deep on medium and coarse textured soils. Species commonly seeded at 10 to 20 lbs. PLS per acre on rangeland. Rate may be increased on disturbed soils and on harsh or eroding surfaces. Seed in late fall or as early in summer as possible in higher mountains. Excellent seedling vigor. Controls weeds and protects from grazing until plants are well rooted and mature seeds have developed.

USE AND MANAGEMENT

Good palatability to livestock and elk when green. Only fair palatability to deer in spring. Canada geese pluck young plants. Seeds relished by livestock in fall. Moderate regrowth in summer but only fair regrowth production in the fall. Use as a pioneer species in seeding mixtures to revegetate livestock and big game ranges and to protect roads, ski slopes, mined lands, and burned-over forest lands. Rotation grazing of native stands is the best management for species. Encourage self-seeding to improve stand longevity.

IMPROVED VARIETIES

'Bromar' released from Washington

'Garnet' released from Colorado

'UP Cold Springs' released from Colorado

SMOOTH BROME

Bromos inermis



ORIGIN AND DESCRIPTION

Native to Europe, Russia and Siberia. Introduced as a pasture forage and conservation plant and widely distributed over northern U.S. Leafy, medium-sized, cool-season, long-lived, vigorous sod former. Stalks 2 to 4' tall. Leafy at base with brown scaly rhizomes. Leaves broad, flat and smooth. (natural 'M' impression imprinted near the middle on each leaf). Moderately deep roots and extensive rhizomes. Panicle seed head 4 to 8" long. Two distinct types: identified northern adapted to western Canada and the Northern Plains, and Southern, adapted to the corn belt states and central Great Plains.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Thrives in fertile, deep silty and clayey soils in

cooler sub-humid climates. Not very vigorous on sandy and dense clay soils. Performs best in 14 to 20" ppt. but sometimes useful and naturalized along roads, in overflow and subirrigated areas in lower ppt. zones. Good cold tolerance and winter hardiness. Adapted 5,000 to 11,000' elevation if managed properly in central and southern Rocky Mountains, but does not persist above 9,000' in northern Rockies. Growth subsides during summer heat. Good seedling vigor.

CULTURE

Plant 1/4 - 3/4" deep on fine to coarse soils, respectively. Cover broadcast seeding to similar depth. Use 6 to 10 lbs. PLS per acre. Increase seeding rates if broadcast seeding. Mulch dry sites and steep slopes. Plant in early spring, late fall or early fall before October. Needs weed control and protection from grazing the first year.

USE AND MANAGEMENT

Used for non-irrigated or limited irrigated pasture and hay. Used in mixtures for irrigated pastures in the Southwest. Often mixed with Alfalfa for hay at higher elevations. Used for soil conservation and stabilization in grass waterways, terrace outlets, drainage ditches and roadsides. Used for mine reclamation and game preservations. Good grazing management and fertility will prevent Smooth Brome from becoming sod- bound and poor producer.

IMPROVED VARIETIES

Southern Origin:

'Achenback' released from Kansas

'Barton' released from Iowa

'Baylor' released from Iowa

'Elsberry' released from Missouri

'Lancaster' released from Nebraska

'Lincoln' released from Nebraska

Northern Origin:

'Manchar' released from Washington

'Superior', 'Carlton', 'Jubilee', 'Polar',

'Brovo'

BUFFALOGRASS

Bouteloua dactyloides



ORIGIN AND DESCRIPTION

Native to southern Great Plains, Texas, Arizona and Colorado. A warm season, low growing, perennial sod-forming grass. Grows up to 4" high. Spreads rapidly by surface runners and forms a dense matted turf. Leaves fine, grayish-green during growing season, turning to light straw color when plants mature. It is a dominant species of much of the short-grass region of the upland areas of the central Great Plains.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Adapted to a wide range of soils and climatic conditions. Grows in calcareous clay and clay loam soils. Often found in native stands of Blue Grama. Often survives in a nearly pure stand with extreme overgrazing. Begins growth in May and June and continues through the summer.

Good cold tolerance. Withstands heavy grazing better than most grasses. Spreads by burrs, seed and weak stolons. It is rather unique in that the plants are unisexual (dioecious). About 1/2 of the plants in nature are female and produce seed burrs. Usually special equipment is used in harvesting the burrs, which are found at or near ground level. The others are male in function and produce pollen.

CULTURE

Drill seed about 1/2" deep in pure stands at the rate of 11 to 20 lbs. PLS per acre. Use a firm seedbed. Plant April to May in central Great Plains or slightly earlier in southern Great Plains and June to July 15th in Southwest. Often seeded in winter months with emergence expected when soil temperatures rise. Usually seeded in mixtures with other adapted native grasses. Better establishment using a protective cover of non-volunteering crop, stubble, or mulch. Tall growing plants can over-top Buffalo Grass and reduce stands.

USE AND MANAGEMENT

Provides an excellent ground cover, wide climatic adaptation. It is relatively easy to establish and can be used for low maintenance turf. Ideally suited for erosion control on range and pasture with heavy soils. Widely used for forage. Withstands heavy grazing better than other grasses native to the Great Plains region. However, it should be properly managed and cared for. It is a very palatable grass but very low growing.

IMPROVED VARIETIES

- 'Texoka' released from Oklahoma
- 'Bison' released from Oklahoma
- 'Plains' released from Texas
- 'Topgun' released from Texas
- 'Cody' released from Nebraska
- 'Bowie' released from Native Turf Group and the University of Nebraska
- 'Sundancer' released from Native Turf Group and the University of Nebraska

REED CANARYGRASS

Phalaris arundinacea



ORIGIN AND DESCRIPTION

Native to North America. Large, moderately coarse, tall, cool-season, sod-forming grass. Thick culms, 3 to 6' tall, from large leafy sod clumps. Roots shallow, stout, spreading rhizomes. Leaf blades flat, thick, and rigid, up to 1" wide. Inflorescence a narrow, dense panicle 3 to 7" long.

GROWTH HABIT AND ENVIRONMENTAL PREFERENCES

Thrives on poorly drained, wetland areas that are frequently flooded or subirrigated, especially in silty or clayey textured soils. Moderately tolerant of coarser sandy soils. Thrives on uplands under irrigation. Growth starts in early spring and continues until frost with adequate moisture and fertility. High forage yielding.

Only moderate drought tolerance. Winterkills without adequate moisture or snow cover. Occurs

from near sea level to about 9,000' elevation in Rocky Mountains.

Moderate tolerance of saline and acidic soils. Not shade tolerant. Some tolerance of controlled burning due to rhizomes. Strong tolerance of grazing except in early growth stages. Competitive, rapidly spreading by seeds and rhizomes. Incompatible with most species, but can retain in legume mixtures with intensive culture and management.

CULTURE

Drill seed 1/4 - 3/4" deep in fine to medium coarse textured soils or broadcast seed and cover to similar depths. Drill seed 3 to 6 lbs. PLS per acre for pasture. Use only seed tested recently because seeds rapidly lose viability. Most successful seeding dates are spring, late summer; or late fall on poorly drained areas. Seeds germinate slowly and irregularly. Full stands may not be attained until third season. New seedlings need weed control and protection from grazing. Stands also established by pushing sod pieces or jointed stems into wet soils.

USE AND MANAGEMENT

Widely used, especially in north central and Pacific Northwest for humid, wet, or irrigated pasture, hay, and silage. Valuable for gully control and maintenance of grassed stream channel, edges of farm ponds, and silting basins. Useful with industrial and farm effluents disposed systems. A potential weed and silt accumulator along slow and shallow streams. Considered on mined lands only if adequate moisture or receives additional irrigation. Medium palatability to livestock when actively growing.

IMPROVED VARIETIES

'Ioreed' released from Iowa

'Palaton' and 'Venture' from Iowa

'Rival' released from Canada

PRAIRIE CORDGRASS

Spartina pectinata



ORIGIN AND DESCRIPTION

Native to U.S. and distributed throughout the Great Plains and north to Canada. A warm-season, coarse, rhizomatous, perennial grass 3 to 6' tall forming dense sod patches. Leaves 8 to 24" long, rolled when dry. Seed head spike with spikelets 2 to 3" long.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Adapted to saline soils along streams and lake edges and subirrigated areas. In the eastern states, extends into brackish marshes along the coast. Growth starts early in the spring with rapid growth occurring from late spring through summer. Grows in dense mats from stout, scaly rhizomes. May grow in almost pure stands. Produces seed heads in late summer.

CULTURE

Plant 1/4" deep on finely textured soils and 3/4" on coarse textured soils. Firm seedbed desired. Seed in non-volunteering crop stubble or mulch needed on eroded sites. Irrigation, if available, aids in getting stands started. Plant about 5 lb. PLS per acre, more if broadcasting on bare or harsher sites or for dense, early stands. Seeding dates vary from April 1 to May 15 in central Great Plains, January to April in southern Great Plains, and June 15 to July 15 for Transpecos and southwestern areas.

USE AND MANAGEMENT

Used for pasture and hay. Early growth can be grazed or cut for hay. Mature growth becomes harsh and stemmy. Where this grass is a key management species, no more than 50 % of current years growth by weight should be grazed. Heavy spring grazing will weaken plants. Prairie Cordgrass responds to summer grazing deferments of at least 90 days every 2 to 3 years.

IMPROVED VARIETIES

'Atkins' released from Kansas

'Red River' released from North Dakota

SAND DROPSEED

Sporobolus cryptandrus



ORIGIN AND DESCRIPTION

Native warm-season perennial bunchgrass, 2 to 3' tall, with leaves fairly numerous and 4 to 12" long. Open, finely branched, paniced seed head may stay in a stem-like roll until seed matures. Then the seed is cast out, thus its name 'dropseed'. Roots coarse, fibrous and penetrating. Occurs abundantly on sandy open sites in Southern Plains and Southwest. Widely distributed elsewhere in U.S.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Adapted to dry sandy sites. Invades open, denuded soil and most prevalent on sandy soil.

Produces a rather large amount of forage highly palatable when young and green but becomes somewhat wiry as it matures. A prolific seed producer but very small size (5 million seed per lb.) Usually planted in mixtures for revegetation cover.

CULTURE

Plant seed on the surface or no more than 1/4" deep. May use cultipacker to cover. However, do not cover too deep. Use 0.2 to 1 lb. PLS per acre for pure stands, but much less in mixture. Plant in non-volunteering stubble as sorghum stubble or mulching may be desired along with light irrigation if available. Planting into basins or furrows may result in better stands. Seed germinates rapidly with moisture and at 70 to 80° F. temperatures.

USE AND MANAGEMENT

Used for hay and grazing if utilized when plants are green. Also, its wide spread occurrence has encouraged its use in revegetative work, such as soil conservation, mine reclamation, disturbed sites stabilization, etc. Graze early to utilize early spring growth before more palatable species become available. Medium palatability early, and fair to poor later and in winter. Sand dropseed increases under heavy grazing. Do not over graze. Manage to maintain all species present in mixtures.

IMPROVED VARIETIES

'Borden County' released from Texas

ALPINE FESCUE

Festuca brachyphylla



ORIGIN AND DESCRIPTION

Native short grass, somewhat sod-forming, culms 6 to 10" tall; occurs at higher elevations and northern latitudes. Grows in the cooler and higher regions of northwestern U.S. Flowering head is a panicle, 1/2 to 2" long. Short awned heads. Leaves smooth, short, and rather lax.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Found on rocky slopes at high elevations, mostly above timberline. Cold tolerant. Occurring in the alpine and subalpine zones.

CULTURE

Plant seed 1/4 - 1/2" deep on coarse textured soils and 1/4" or shallower on fine-textured soils. Better stands obtained on firm seedbed. Drill a minimum of 2 to 4 lbs. PLS per acre for satisfactory stands. Increase rate 50 - 100% for harsh sites, steep open exposures, poorer seedbeds and when broadcasting. Plant seed as soon after disturbance as possible in mountain environment. Mulching is recommended. Protect new seeding from grazing.

USE AND MANAGEMENT

Use in seeding mixtures to revegetate big game ranges, roads, ski slopes, and mined lands. Also cultivated for boarder plantings and rock gardens. Palatability to all classes of livestock, elk and deer. Produces good forage that remains green throughout the summer.

IMPROVED VARIETIES

None listed for region

ARIZONA FESCUE

Festuca arizonica



ORIGIN AND DESCRIPTOIN

Native to the Ponderosa Pine zone from Colorado, south to west Texas, Mexico and Nevada. A long-lived, perennial, cool season Bunchgrass. Culms are densely tufted in large bunches, 1 to 3' tall. Numerous fine basal leaves. Seed head narrow, 3 to 6" long panicle. Has a dense, coarse, fibrous root system, similar to Idaho Fescue.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Found on shallow clay, loam-to-loam, and sandy to gravelly soils. Does not tolerate high pH calcareous soils. It is common in the Ponderosa Pine zone from 6,000 to 10,000' elevation. Commonly associated with Mountain Muhly. Larger plants have lemmas with shorter awn tips. It has a cool season growth habit, but may make only a little spring growth due to a dry season. Matures late summer with little fall regrowth. Seedlings develop usually limited in native habitats.

CULTURE

Propagation by seed. Plant seed 1/4 - 1/2" deep on coarse textured soils and 1/4" or shallower on fine-textured soils. Better stands obtained on firm seedbed. Drill a minimum of 2 to 5 lbs. PLS per acre. Increase rate 50 - 100% for harsh sites, south, west, or steep exposures, poorer seedbeds, and when broadcasting. Seedling vigor only fair. Stands do not develop until the second or third year. Mulch on steep slopes and highly erosive sites. Seed in early spring at lower altitudes with reliable moisture and late fall with uncertain moisture and at lower mountain elevations. Seed in spring as early as possible, at higher mountain elevations.

USE AND MANAGEMENT

Because of heavy root system, it is an excellent soil binder. Suited for revegetating and stabilizing disturbed soils, road, ski slopes and construction in the mountains. Moderately palatable, can be used for forage and range land restoration. Has moderate grazing tolerance and remains at least partly green from spring through fall only. Fair tolerance of wildfires.

IMPROVED VARIETIES

'Redondo' released from New Mexico

CHEWING FESCUE

Festuca rubra ssp. *fallax*



ORIGIN AND DESCRIPTION

Introduced into North America from Europe for general-purpose turf and erosion control. Cool-season, long-lived, Bunchgrass. Grows more erect than red fescue. Culms 1 to 2' tall loosely or closely tufted, bent or decumbent at base. Leaves numerous, fine, blue green, narrow, with inrolled leaf blades. Small panicle seed head. Many low-growing selections used for turf grass.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Grows over a wide range of soil types, including silty to clayey soils. Adapted to humid moist sites in the northern states. Valuable for shade tolerance.

CULTURE

Plant seed 1/4 - 1/2" deep on coarse textured soils and 1/4" or shallower on fine-textured soils. Better stands obtained on firm seedbed. Drill a minimum of 1.5 to 3.0 lbs. PLS per acre for satisfactory stands on dry land. Seed 2 to 3 lbs. per 1,000-sq. ft. for turf establishment. Increase rate 50-100% for harsh sites, when broadcasting and with irrigation. Seed in early spring at lower altitudes with reliable moisture or irrigation and late fall at lower mountain elevations. Seed as soon as possible after disturbance at higher mountain elevations.

USE AND MANAGEMENT

Used primarily for lawns and general-purpose turf grass mixtures for shade and winter color. Used on golf greens, roads, cuts and stream bank revegetation. Suitable on irrigated sites or sites having over 18" ppt.

IMPROVED VARIETIES

Many turf types are available. Contact the staff at Pawnee Buttes Seed Inc. for additional information.

CREeping RED FESCUE

Festuca rubra ssp. *arenaria*



ORIGIN AND DESCRIPTION

Introduced into North America from Europe for general-purpose turf and erosion control. Cool season, long-lived, sod-forming grass. Culms, 1 to 2' tall loosely or closely tufted, bent or decumbent at base. Leaves numerous, fine, rough, blue green, narrow, inrolled leafblades. Small panicle seed head. Several low growing selections used for low maintenance turf.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Grows over a wide range of soil types, including silty to clayey soils. Adapted to cool moist sites in the Pacific Northwest and Rocky Mountains, south into Colorado and New Mexico. Valuable shade tolerance.

CULTURE

Plant seed 1/4 - 1/2" deep on coarse textured soils and 1/4" or shallower on fine-textured soils. Better stands obtained on firm seedbed. Drill a minimum of 1.5 to 3.0 lbs. PLS per acre for satisfactory stands on dry land. Seed 2 to 3 lbs. PLS per 1,000-sq. ft. for lawn and turf establishments. Increase rate 50 - 100% for harsh sites, when broadcasting and with irrigation. Seed in early spring at lower altitudes with reliable moisture or irrigation and late fall at lower mountain elevations. Seed as soon as possible following disturbance at higher mountain elevations.

USE AND MANAGEMENT

Used primarily for lawns and general-purpose turf grass mixtures for shade and winter color. Used on golf greens, roads, cuts and stream bank revegetation. Suitable on irrigated sites or sites having over 18" ppt.

Used for pastures in the northern states and Pacific Northwest in relatively moist cool areas.

IMPROVED VARIETIES

Many turf types are available.

Contact the staff at Pawnee Buttes Seed Inc. for additional information.

HARD FESCUE

Festuca brevipila



ORIGIN AND DESCRIPTION

Introduced into North America. Originated in the Baltic States to the Carpathian Mountains through central Europe to the Atlantic. Cool-season, long-lived, bunchgrass. Few upright culms 1 to 3' tall. Numerous fine, rough, bluegreen basal leaves with narrow, inrolled leaf blades. Larger European form of sheep fescue, but also low-growing selections for low maintenance turf.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Thrives on deep, fertile, silty and clayey soils. Less productive on lighter, rockier, and shallower soils. Tolerant of weakly saline, alkaline, and

acid soils. Not tolerant of flooding, high water tables, or inundation. Grows in well-drained meadows, sub-humid grasslands, and semidesert sagebrush sites.

CULTURE

Plant seed 1/4 - 1/2" deep on coarse textured soils and 1/4" or shallower on fine-textured soils. Better stands obtained on firm seedbed. Drill a minimum of 1.5 to 3.0 lbs. PLS per acre for satisfactory stands on rangelands. Increase rate 50-100% for harsh sites and when broadcasting. Because stands are slow to establish, hard fescue is frequently seeded with fast-developing species such as Slender Wheatgrass. Seed in early spring at lower altitudes with reliable moisture in late fall with uncertain moisture and at lower mountain elevations, or in spring as early as possible, at higher mountain elevations.

USE AND MANAGEMENT

Both forage and turf grass type varieties are widely used for turf, golf greens, revegetation and soil conservation purposes. Suitable on irrigated sites or sites having over 14" ppt., as it is less drought-tolerant than sheep fescue. Growth starts in March or April, matures in mid to late summer, varying regionally and altitudinally, then becomes semi-dormant until fall moisture. Makes fair fall regrowth.

IMPROVED VARIETIES

'Durar' released from Washington

Other releases: Turf types:

'Attila', 'Aurora', 'Barcrown', 'Bardur',

'Barreppo', 'Biljar', 'Brigade', 'EcoStar',

'Eureka', 'Gladiator', 'HF 9032', 'Nordic',

'PST-4hd', 'Reliant', 'Scaldis', 'Silvana',

'Spartan', 'SR 3100', 'Waldina', and 'Warick'

IDAHO FESCUE

Festuca idahoensis



ORIGIN AND DESCRIPTION

Native to Intermountain West and inland Pacific Northwest areas. Found from Washington and Montana south to central California and Colorado. Cool-season bunchgrass of small to medium size. Few upright culms 1 to 3' tall. Numerous fine, rough, blue green basal leaves with narrow, inrolled leaf blades. Small panicle seed head, 2 to 5" tall.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Thrives on deep, fertile, silty and clayey soils. Less productive on lighter, rockier, and shallower soils. Tolerant of weakly saline, alkaline, and acid soils. Growth starts in March or April, matures

in mid to late summer, varying regionally and altitudinally, then becomes semi-dormant until fall moisture. Not tolerant of flooding, high water tables, or inundation for any extended period. Grows in well-drained meadows, sub-humid grasslands, and semi-desert sagebrush sites. Thrives in over 15 to 18"ppt. Moderately drought tolerant. Grows between extremes of 800' in the Columbia River Basin and 12,000' elevation in Colorado. Damaged by sagebrush grassland fires. Mature plants and stands strongly competitive.

CULTURE

Plant seed 1/4 - 1/2" deep on coarse textured soils and 1/4" or shallower on fine-textured soils. Better stands obtained on firm seedbed. Drill seeding rate is 2 to 3.5 lbs. PLS per acre for satisfactory stands on rangelands. Increase rate 50-100% for harsh sites and when broadcasting. Seedling vigor fair. Stands may develop second or third year. Seed directly in standing stubble or mulch on steep slopes and highly erosive sites. Seed early spring at lower altitudes with reliable moisture. Seed late fall with uncertain moisture and at lower elevations or as early as possible at higher elevations. Control weeds and withhold grazing during seedling year.

USE AND MANAGEMENT

Used for range seedings, mined lands, and good fall forage in mountainous areas. Medium palatability to livestock. Good palatability to elk yearlong and deer in spring. Moderate grazing tolerance but can be injured by early spring grazing. Apply rest-rotation-grazing system to improve stands.

IMPROVED VARIETIES

'Trident' released from Int'l Seeds Inc. OR

'Nez Perce' released from Idaho

'Joseph' released from Idaho

ROCKY MOUNTAIN FESCUE

Festuca saximontana



ORIGIN AND DESCRIPTION

Native, long-lived, cool season bunchgrass indigenous to the Northern Hemisphere. Dwarf small-tufted bunchgrass, very similar to hard fescue, and more common at higher, subalpine and alpine elevations in Rocky Mountains.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Adapted to open, exposed high altitude sites in Rocky Mountain and northern Intermountain sites with over 8 to 10" ppt. Thrives on fertile, silty and clayey soils. Tolerant of shallow, exposed sites. Cold and drought-tolerant. Grows in well-drained meadows, sub-humid grassland sites. Not tolerant of flooding, high water tables, or inundation for any extended period.

CULTURE

Culture similar to Hard Fescue. Plant seed 1/4 - 1/2" deep on coarse textured soils and 1/4" or shallower on fine-textured soils. Better stands obtained on firm seedbed. Drill seed at 1.5 to 3.0 lbs. PLS per acre for dryland. Use increased seeding rates for turf grass. Increase rate 50 - 100% for harsh sites, (south, west) or steep exposures, poorer seedbeds, and when broadcasting. Seedling vigor is fair. Stands do not develop until the second or third year. Mulch on steep slopes and highly erosive sites. Seed early spring at lower altitudes with reliable moisture, late fall with uncertain moisture and at lower mountain elevations, or in spring or very early summer at higher mountain elevations. Control weeds with mowing or herbicides.

USE AND MANAGEMENT

Used on rangeland, mine lands and as a durable turf grass on sandy soils and for erosion control in northern states. Succeeds better than most grasses on sandy, gravelly soils. Graze early in the spring, however not widely used for forage.

IMPROVED VARIETIES

None listed for region

ROUGH FESCUE

Festuca campestris



ORIGIN AND DESCRIPTION

Native, long-lived, cool season bunchgrass (rarely producing a slender rhizome), indigenous to the Northern Hemisphere. Wildly distributed across Canada and Northern U.S. One of principal grasses in Montana, northern Idaho and eastern Oregon and Washington. Dwarf culms densely

tufted 1 to 3' tall. Leaves flat, narrow, rough and mostly basal. Panicle head 2 to 10" long, spikelets with short awns.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Adapted to prairies, rolling hills and open woodlands 5,000 to 10,000' elevation with 12 to 18" ppt. Cold and drought-tolerant. Not tolerant of flooding, high water tables, or inundation for any extended period. Adapted on dry, deep, and sandy loam soils.

CULTURE

Culture similar to Idaho fescue. Plant seed 1/4 - 3/4" deep on coarse textured soils and 1/2" or shallower on fine-textured soils. Better stands obtained on firm seedbed. Drill seed at 4.3 to 8.6 lbs. PLS per acre. Increase rate 50 - 100% for harsh sites, (south, west), or steep exposures, poorer seedbeds, and when broadcasting. Seedling vigor is fair. Mulch on steep slopes and highly erosive sites. Seed early spring at lower altitudes with reliable moisture. Seed in late fall with uncertain moisture and at lower mountain elevations, or in spring or very early summer, as early as possible, at higher mountain elevations. Control weeds with mowing or herbicides.

USE AND MANAGEMENT

Used on rangeland, mine lands and as a durable grass on sandy soils and for erosion control in northern states. Succeeds better than most grasses on sandy, gravelly soils. Produces large amount of forage.

IMPROVED VARIETIES

None listed for region

SHEEP FESCUE

Festuca filiformis



ORIGIN AND DESCRIPTION

Native, long-lived, cool-season species indigenous to the Northern Hemisphere. Dwarf small-tufted bunchgrass very similar to Idaho Fescue. More common at higher subalpine and alpine elevations in the Rocky Mountains, as well as the Cascade and Sierra Nevada Mountains.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Adapted to open, exposed, high altitude sites in Rocky Mountain and northern intermountain area with over 8 to 10" ppt. Thrives on fertile, silty

and clayey soils. Tolerant of shallow, gravely, and dry, weakly saline and acid soils. Cold and drought-tolerant. Grows in well-drained meadows, sub-humid grasslands, and semi-desert sagebrush sites. Not tolerant of flooding, high water tables, or inundation for any extended period.

CULTURE

Culture similar to Idaho Fescue. Plant seed 1/4 - 1/2" deep or shallower on fine-textured soils. Better stands obtained on firm seedbed. Drill seed at 1.5 to 3 lbs. PLS per acre for dryland. Use increased seeding rates for turf grass. Increase rate 50 - 100% for harsh sites, (south, west), or steep exposures, poorer seedbeds, and when broadcasting. Seedling vigor only fair stands do not develop until the second or third year. Mulch on steep slopes and highly erosive sites. Seed early spring at lower altitudes with reliable moisture, late fall with uncertain moisture and at lower mountain elevations. Also seed in spring or very early summer, as early as possible, at higher mountain elevations. Control weeds with mowing or herbicides.

USE AND MANAGEMENT

Used on rangeland, mined lands and as a durable turf grass on sandy soils and for erosion control in northern states. Succeeds better than most grasses on sandy, gravely soils. Turfgrass recommended on infertile, acid, or droughty soils where supplemental irrigation and fertilizer are not applied. Graze early in the spring, but not widely used for forage. Stands of forage types are long-lived and productive once established on pinyon/juniper areas of western Colorado.

IMPROVED VARIETIES

'Cover' released from WA, ID and OR

'Bighorn' (turf) released by Turf-Seed Inc.

'MX-86' (turf) released by Jacklin Seed Co.

'SR-3000' (turf) released from Oregon

'Azay', 'Quatro', 'Paradise', and 'Ovina'

TALL FESCUE

Schedonorus arundinaceus



ORIGIN AND DESCRIPTION

Introduced from Europe, wide adaptation in U.S. However, its agronomic use is centralized in the humid mid-South, West Coast, and cool interior regions. It is a cool-season, medium-sized Bunchgrass. Leafy base with ascending culms 1 to 3' tall. Wide dark green leaves. Produces a large volume of deep, coarsely fibrous roots. Winter growth in warmer southern climates and mostly in spring, summer and fall growth at higher latitudes and western states.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Best on deep rich to silty clay soils, but will grow well on all soils with adequate moisture.

Wide pH range, tolerant of moderate saline and acid soils. Will tolerate poorly drained, winter flooding, and fairly high water tables. Not drought-tolerant but survives in 16 to 18" ppt. in cooler regions of northern and western mountains. In the East optimal growth at 20 to 30" ppt.

CULTURE

Drill seed 1/2 - 1" with good soil and moisture conditions. Drill seeding rate is 4 to 8 lbs. PLS per acre. Increase seeding rate for broadcast seedings and under certain harsh conditions. Seed in the early spring or when water is available to keep new seedlings moist during established period. Seedling vigor is generally good. Control weeds and protect new seedlings from grazing until rooted and mature seedheads produced.

USE AND MANAGEMENT

Used for both non-irrigated and irrigated pasture and hay; alone or with legumes; Also used on roads, dikes, waterways, recreational areas and cover crops in orchards. Used over the east and north-east 1/3 of the United States for lawns and turf.

Continuous grazing in humid regions. Periodic grazing to 2 to 4" stubble in sub-humid or irrigated areas to maintain good growth and palatability. Needs annual nitrogen program if legumes not present. Some problems with certain diseases exist in pasture usage. Check with local specialists.

IMPROVED VARIETIES

'Alta' released from Oregon
'Goar' released from California
'Fawn' released from Oregon
'Kenmount' released from KY and MT
'Kentucky 31' released from Kentucky
'Festorina' released from Canada/Netherlands
'Chieftian' dwarf turf type
'Rebel' dwarf turf type
'Crewcut' dwarf turf type
Many other pasture and turf types

CREeping MEADOW FOXTAIL

Alopecurus arundinaceus



ORIGIN AND DESCRIPTION

Native to Eurasia. Introduced as a forage plant and distributed over northern U.S. Adapted in moist areas of the northern Great Plains, Pacific Northwest, and intermountain region. Medium-sized, cool-season, long-lived, vigorous sod former. Stalks 2 to 4' tall, leafy at base, broad, flat, smooth leaves. Moderately deep and extensive root system with strong rhizomes.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Thrives in moist, fertile, deep silty and clayey soils in cooler sub-humid zones. Not very vigorous on sandy and dense clay soils. Best performance in 20 to 22" ppt. but useful and naturalized in

overflow and subirrigated areas. Will survive complete inundation in spring and shallow water during the summer. Good frost tolerance and winter hardiness. Adapted to high mountain meadows.

CULTURE

Plant at 1/2 - 3/4" depth on fine to coarse soils, respectively. Cover broadcast seed similarly. Use 1.5 to 3.0 lbs. PLS per acre and increase seeding rates if broadcast. Keep area moist during seedling establishment. Seed wetland areas when accessible or use late fall seedings. Needs weed control during establishment and in seedling stage for first year.

USE AND MANAGEMENT

Used for irrigated pasture and hay on poorly drained and acid soils from sea level to high mountain meadows. It is a very high forage-producing and palatable grass with high protein. Also, moderately tolerant of saline and alkaline soil conditions. Starts growth early in the spring and has good spring growth and recovers rapidly after cutting or grazing. Fertilize for high production.

Also adapted to some industrial liquid waste management systems in conjunction with pastures and hay production. High user of nitrogen.

IMPROVED VARIETIES

'Garrison' released from ND and WY

'Retain' released from South Dakota

JAMES' GALLETA

Paronychia jamesii



ORIGIN AND DESCRIPTION

Native to dry deserts of the southwestern U.S. Found from Wyoming and Nevada, south to California and east to the Great Plains. Short to medium-sized, warm season, bunchy sod-former. Culms 1 to 2' tall, leafy based, hairy at nodes; stout roots, short, scaly, and woody rhizomes. Short, pale blue-green leaves before maturity. One to 3" spike head purplish before maturity.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Thrives on silty and clayey soils in southwestern Great Plains and also nearly as thrifty on some

well-drained soils and fractured rocklands in Colorado Plateau region. Tolerant of moderately saline and alkaline soils. Survives on cold and warm desert sites with 9 to 16" ppt. May start growth with available moisture in spring and matures one seed crop in June and second in August to October. Regrowth volume is moderate with good summer rainfall. Occurs naturally from 4,000 to 8,000' elevation. Extremely drought-resistant, cold tolerant, and winter-hardy with weak shade tolerance. Moderate fire tolerance and strong grazing resistance, but should not be grazed too closely.

CULTURE

Drill seed at 1/2" depth on fine-textured soils up to 1" on coarse soils or drier seedbeds with special drill equipped to handle chaffy seed. May broadcast seed and cover at about same depths. Seed in furrows, basins or pits using deep furrow drills and may aid in stand establishment on drier sites. Plant 2 to 10 lbs. PLS per acre. May be planted early, from time soil temperatures are warm enough and soil moisture is available, probably from May 15 to July 15. Mulch or clean stubble is very helpful for stand establishment. Surface should be moist for first two-week period. New seedlings may need weed control and should not be grazed the first growing season.

USE AND MANAGEMENT

Used for mined land reclamation, roads, and rangelands on heavy, dry saline soils. Native stands are grazed by cattle, sheep, and bison. May be grazed moderately year around or more heavily under a planned rotation system. Species sometimes used in mixtures for forage and soil stabilization purposes where it is naturally a primary grass.

IMPROVED VARIETIES

'Viva' released from NM and CO

BLACK GRAMA

Bouteloua eriopoda



ORIGIN AND DESCRIPTION

Native warm season, sod-forming grass of arid and semiarid deserts grasslands in New Mexico, Arizona, Oklahoma, and Texas. Culms, in contact with soil, will root at nodes under favorable conditions to form new plants (stoloniferous). Culms 12 to 22" tall with gray-green basal leaves. Leaves are 1 to 5" long.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Best adapted to mesa and hills, dry open ground at 2,000 to 7,000' elevation. Commonly on shallow sandy sites. Tolerant of saline soils. Rarely seen on even weakly acid soils. Very drought-tolerant, has the ability to become semi-dormant and make quick recovery when moisture comes. Has good winter hardiness.

CULTURE

Drill seed (with special grass drill) 1/4 - 1/2' deep on firm seedbed or broadcast about same depth. Better establishment in standing mulch stubble or mulch cover. Needs surface moisture during first 3 weeks of establishment. Plant 1 to 2 lbs. PLS per acre. Plant April to mid-May in central Great Plains, slightly earlier in southern Great Plains and June 15 to July 15 in Southwest. Often seeded in winter months with emergence in the spring when soil temperatures rise. Control weeds and protect from grazing until plants well-rooted and produced seed heads.

USE AND MANAGEMENT

Used for pasture and range revegetation. Also widely used over much of the Southwest and southern Great Plains area for reseeding disturbed or go-back cropland. Excellent palatability and feed value both summer and winter. Heavy summer grazing often prevents reproduction by tillers and stolons.

Native stands may be grazed continuously all summer or all year long if not overgrazed. Highly nutritional, even when dormant in wintertime. Rotational grazing should be practiced to maintain or restore range to optimal production. When Black Grama is grazed properly, associated plants will also grow well.

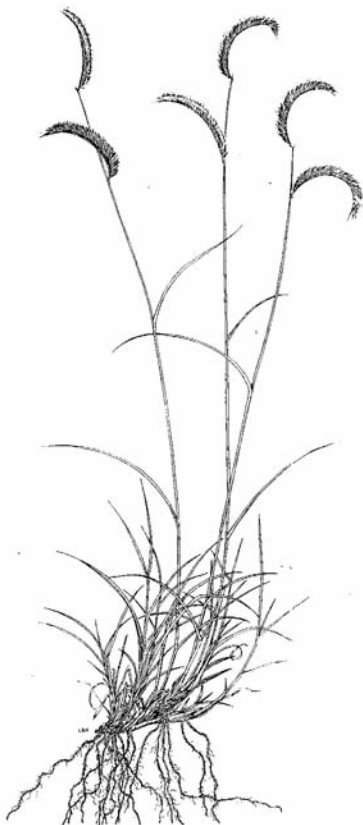
IMPROVED VARIETIES

'Nogal' released from New Mexico

'Sonora' released from Arizona

BLUE GRAMA

Bouteloua gracilis



ORIGIN AND DESCRIPTION

Major native species of the western Great Plains and the Southwest. One of the most widely distributed of all native grasses. A warm season, open sod-forming short grass. However, it has a bunchgrass growth form in the South and is more of a sod-former in the North, at higher elevations and when closely grazed. Densely tufted, usually 6 to 24" tall with gray-green basal leaves. Has bluish-purple cast when young and takes on straw color at maturity.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Best adapted on heavy, rolling upland soils. Does well on sandy to clayey soils, less vigorous on sands and clays. Tolerant of soil salinity and commonly persists on alkaline soils. Rarely seen on even weakly acid soils. Rather low level of fertility demand. Not shade-tolerant. Very drought-tolerant. Has unique ability to become semi-dormant and make quick recovery when moisture comes. Good winter-hardiness. May produce two or more seed crops in one year, with proper moisture may flower and produce seed in 60 days.

CULTURE

Drill seed (with special grass drill) 1/4 - 1/2" deep on firm seedbed or broadcast about same depth. Better establishment in protective cover of non-volunteering crop, stubble or mulch. Plant 1 to 3 lbs. PLS per acre. Plant April to mid-May in Central Great Plains, slightly earlier in southern Great Plains and June 15 to July 15 in Southwest. Often seeded in winter months with emergence expected when soil temperatures rise. Control weeds and protect from grazing until plants well rooted and have produced seed heads.

USE AND MANAGEMENT

Widely used for range, pasture, and occasionally for hay. Often seeded in mixtures to control erosion. In more recent years has been used to some extent for lawns. Also widely used over much of the Southwest and the Great Plains area for reseeding disturbed or abandoned cultivated acres. Native stands may be grazed continuously all summer or all year long if not overgrazed. Highly nutritional, even when dormant in winter-time. Rotational grazing should be practiced.

IMPROVED VARIETIES

'Alma' released from NM and CO
'Lovington' released from New Mexico
'Hachita' released from NM and CO
'Bad River' released from South Dakota
'Birdseye' released from Montana

SIDEOATS GRAMA

Bouteloua curtipendula



ORIGIN AND DESCRIPTION

Native to U.S. and widely distributed eastward from Rocky Mountains. Warm season, bunchy sod-forming grass, erect 1 to 3' tall, usually with short scaly rhizomes. Leaves bluish-green, drying brown. Spike-like head with 1 to 12 (or more) spikelets dangling from one side of the rachis. Spikelets fall off after maturity.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Adapted to wide spectrum of sandy to clayey soils and less tolerant of loose sands and heavy clays. Some tolerance of soil salinity. Best on finely textured soils of uplands with 17 to 20" ppt. in central Great Plains. Also grows with 12

to 16" ppt. in the Southwest. Moderate drought resistance. Good winter hardiness with well adapted strains. Southern strains or seed sources usually produce more forage but may not be winter hardy. Use caution in selecting seed sources. May be damaged by fire unless properly timed and controlled.

CULTURE

Plant 1/4 - 1/2" deep on finely textured and 3/4" on coarse textured soils. Firm seedbed desired. Seed in non-volunteering crop stubble or mulch on eroded sites. Irrigation, if available, aids in getting stands started. Plant 4 to 8 lbs. PLS per acre, more if broadcasting on bare or harsher sites or for denser, early stands. Seeding dates vary from April 1 to May 15 in central Great Plains and January to April in southern Great Plains and June 15 to July 15 for Transpecos and Southwest. New seedings require weed control by grazing, herbicides or mowing.

USE AND MANAGEMENT

Used for range forage, pasture and hay, mixtures (or pure stands) in conservation work on eroding fields, depleted ranges and bare fields. Graze stands moderately, leave 3 to 6" of stubble. High palatability in late spring and summer. Fair forage value when mature. Most widely distributed grama grass usually occurring in mixtures, with Blue Grama, Little Bluestem and certain forbs and shrubs.

IMPROVED VARIETIES

'Niner' released from New Mexico
'Butte' released from Nebraska
'Coronado' released from New Mexico
'Pierre' released from South Dakota
'Premier' released from Mexico
'Trailway' released from Nebraska
'Tucson' released from Arizona
'Uvalde' released from Texas
'Vaughn' released from New Mexico
'El Reno' released from Oklahoma
'Killdeer' released from North Dakota

TUFTED HAIRGRASS

Deschampsia cespitosa



ORIGIN AND DESCRIPTION

Native to the mountains in western U.S. but also found from East Coast to the West Coast in northern latitudes. Long-lived, cool-season tufted perennial bunchgrass. Found along streams, in wet meadows, ditches and open areas surrounding lakes and ponds. Culms 2 to 4' tall. Open panicles 4 to 8" long with fine spreading branches. Fine leaves, stem and seed head.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Thrives on deep, fertile, moist, medium to finely textured soils. Will tolerate moderately acid to

neutral (pH 4.5 to - 7.0) soils. Weakly moderate drought tolerance. Vigorous native stands occur in 20" ppt. Good winter hardiness, common along northern coast at 3,000' elevation. Occurs chiefly in spruce-fir forests, above timberline, and in moist aspen stands. Adapted to wet or damp mountain sites at 7,000 to 13,000' elevations, but reportedly grows well on fairly dry soils, especially in open communities and disturbed sites at high elevations.

Native stands may occur in monocultures but can be mixed with needlegrasses (*Stipa* spp.), fescues (*Festuca* spp.), wheatgrasses (*Agropyron* spp.), bluegrasses (*Poa* spp.), forbs, and shrubs.

CULTURE

Drill seed about 1/4" deep or broadcast using 0.8 to 1.6 lbs. PLS per acre, seed rate should be increased on disturbed soils and on harsh or eroding surfaces. Seeds are extremely small. Supplemental mulch aids soil stabilization and stand establishment on steep and erosive sites. Seed in late fall or as early in summer as possible in higher mountains. Weed control is essential.

USE AND MANAGEMENT

Used in seeding mixtures at high elevations on ski slopes, mined lands, burned-over forestlands and restoration for livestock and big game. Good palatability for livestock and elk when green. Moderate regrowth production in summer and fall. Some introduced varieties have been specifically selected for forage production at northern latitudes but may not have the cold tolerance of native ecotypes at high elevations.

IMPROVED VARIETIES

'Peru Creek' released from Colorado

'Nortran' released from Alaska

'Tillamock' released from Oregon

'Willamette' released from Oregon

YELLOW INDIANGRASS

Sorghastrum nutans



ORIGIN AND DESCRIPTION

Native to approximately eastern two-thirds of U.S. including the Great Plains states. Warm season, bunching, sod-former. Culms 3 to 5' tall. Wide leaves up to 24" long and panicle-type head, semi-dense 6 to 12" long. Golden brown to golden.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Thrives on deep moist soils, from clay to coarse sandy textures. Tolerant of moderate salinity and moderate acidity. Fair drought tolerance. Tolerates some flooding, underground water tables, imperfect drainage. Is winter-hardy, adapted from near sea level to 7000' elevation. Can stand some shade. Starts growth in late spring and matures in late summer or early fall.

CULTURE

Plant seeds 1/4 - 3/4" deep in firm seedbed. Seed 4.5 to 10 Lbs. PLS per acre. Time of seeding varies with region but should be approximately January to April on southern Great Plains and a month or so later in the northern Great Plains. Plant in stubble or mulch. Germination time is approximately 28 days after planting. Better stands in areas of high wind erosions if planted in sorghum or udan stubble. Irrigation and/or supplemental mulching may be beneficial to establish stands. Weed control maybe necessary by cutting or herbicides. Protect new seedlings from grazing until plants are well established.

USE AND MANAGEMENT

Used in mixtures for graze forage and hay production. Often in pure stands or in mixtures with Bluestems, Switchgrass and/or Partridge Peas, or other legumes. Manage to give periodic rest during growing season, also periodic burning of accumulating litter. Very palatable in summer. Tolerates winter grazing but not as palatable. Responds well to additional supplemental irrigation.

IMPROVED VARIETIES

- 'Cheyenne' released from OK and TX
- 'Holt' released from Nebraska
- 'Llano' released from New Mexico
- 'Nebraska 54' released from Nebraska
- 'Osage' released from Kansas
- 'Tejas' released from Texas
- 'Lometa' released from Texas
- 'Tomahawk' released from ND, SD, and MO
- 'Oto' released from Nebraska

PRAIRIE JUNEGRASS

Koeleria macrantha



ORIGIN AND DESCRIPTION

Native to U.S. Ranges from southern Canada to Texas, California, and Washington. The only species of *Koeleria* native to western North America. Slender, cool-season, tufted perennial bunchgrass. Plants seldom over 1 to 2.5' tall with narrow spike like heads 2 to 7" long. Sometimes with short awns.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Although rarely forms pure stands, it is found at mid ranges widely spread over a variety of dry to moist soils. Adapted to wide spectrum of sandy to clayey soils, but tolerant of gravelly or

rocky sites. Most characteristic of sandy or clay loam with 16 to 20" ppt. Also found near springs as well as on dry rocky ridges. Occurs throughout the sagebrush, aspen, ponderosa pine, and lodgepole pine zones. Often grows in open woodlands and ponderosa pine at 5,000 to 10,000' elevation and is an important forage grass in open timber types. Some drought resistance and good winter hardiness.

CULTURE

Plant 1/4 - 1/2" deep on fine-textured soils and up to 3/4" deep on coarse textured soils. Firm seedbed desired. Seed into non-volunteering crop, stubble or mulch needed on eroded sites. Plant 0.5 to 1.0 lbs. PLS per acre and increase seeding rate if broadcasting on bare or harsher sites or for denser, early stands. Seeding dates vary to fall dormant or early to mid-spring in high country, and early July in southern summer rainfall zones. Use dormant fall seeding if soils have to be tilled before planting. New seedlings, particularly with summer planting, require weed control by herbicides or mowing.

USE AND MANAGEMENT

Used for revegetation on rangeland, mine lands, construction activities, for brush control and after fires. Good forage early in the season, matures relatively early on much of its range. This may explain why it is usually not over grazed late in the season. Can be used in mixtures for conservation work on eroding fields, depleted ranges, and bare-eroding and disturbed fields. Graze moderately: leave 3 to 6" of stubble to maintain stands. Depleted rangeland may need summer deferment. Should be allowed to mature as a seed crop occasionally.

IMPROVED VARIETIES

None listed for region

'Barkoel' from Holland a turfgrass type

KLEINGRASS

Panicum coloratum



ORIGIN AND DESCRIPTION

A warm season, perennial bunchgrass introduced from Africa. It is fine stemmed, leafy and grows 3 to 4' tall at maturity. Quite variable in makeup, sometimes prostrate but mostly erect. Tends to spread by tillers or short rhizomes, and will root at the nodes when stems contact moist soil. Seed head is a fine-branched panicle, sometimes almost fan-shaped, similar to the switchgrass panicle head.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Adapted to a wide range of heavy soils and dry conditions in central Texas and on wet soils in

the Gulf coast. Has been grown successfully on shallow and deep sandy soils and medium textured soils in the Rio Grande Plains. Considerable drought tolerance but not cold tolerant. Adapted to southern New Mexico, and Oklahoma, Texas, and Arizona. Does well on loamy to clayey soils and is salt tolerant. Good forage production with 18" to 24" ppt. or under irrigation.

CULTURE

Drill 1/4 - 3/4" deep on fine soils and up to 1" deep on coarser or prepacked sandy soils. Plant 1 to 2 lbs. PLS per acre depending on stand desired and 50 - 100% more seed on erosive sites or broadcasting. Seed in non-volunteering crop stubble for better stands on erosive sites. Planted in the spring after danger of frost is past or in early fall. Initial growth is slow and weed control is necessary. Grazing should be restricted until new plants are well established.

USE AND MANAGEMENT

Used for hay, pasture and silage, primarily used in Texas. Makes large tonnage of good quality hay if harvested at the proper time. Also used in conservation, soil stabilization and revegetation on depleted soils or range conditions. May be grazed rather heavily if used in a short duration grazing system. May be damaged with extended periods of over grazing. Palatability is best if utilized before maturity. Fertilize for optimum growth and production.

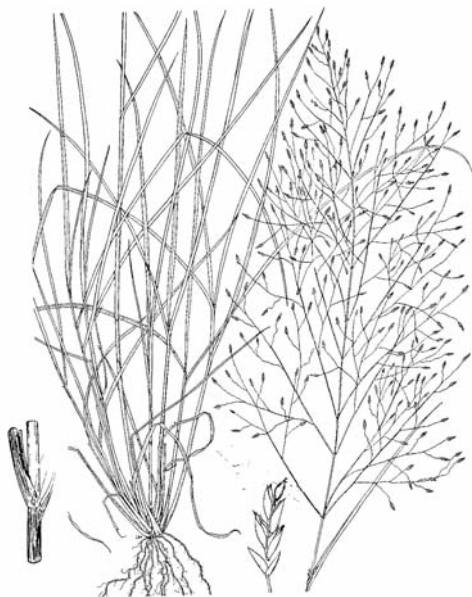
Responds well to fertilizer and irrigation. Cures for good winter forage in drier regions. Growth starts in early spring and continues to late fall.

IMPROVED VARIETIES

'Selection-75', 'TEM-LD1', 'TEM-SR1', and 'Verde' released from Texas
'OKPC-1' released from Oklahoma

SAND LOVEGRASS

Eragrostis trichodes



ORIGIN AND DESCRIPTION

Native warm-season, short-lived perennial bunchgrass. Occurs on sandy soils of central and southern Great Plains. Densely tufted with stalks 2 to 5' tall, abundant basal leaves 1 to 2' long. Elongated, open, purplish panicle-type inflorescence, 6 to 10" long. Deep fibrous roots and good drought resistance.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Grows principally on deep sands and sandy loam soils. Starts growing early in the spring and remains green until fall. Flowers in late spring and again in late summer or fall. Good regrowth with adequate soil moisture. Does well on fertile sandy to silty textured soils in warm

temperate to subtropical subhumid climates. Will grow on coarse sandy or clayey soils of lower fertility. Better performance in 20 to 40" ppt. areas, but will grow well in 14 to 20" ppt.

CULTURE

Drill seed 1/2" deep on sandy and loam soils, 1/4" deep on heavier textured soils. Better stands in areas of high wind erosion if planted in sorghum or sudan stubble. Use pits, basing, or furrows in more arid areas of Southwest. Irrigation and/or supplemental mulching may be beneficial to establish stands. Good seedling vigor. Seeding rate is 1 to 2 lbs. PLS per acre. Time of seeding varies with region, but should be seeded approximately one month before the most favorable moisture and temperature for quick germination. February in South and as late as June in the northern limits of adaptation. Seedlings need to be protected from weeds and insects.

USE AND MANAGEMENT

Primarily used for grazing by livestock and sometimes cut for hay. Included in mixtures for quick ground cover on disturbed, burned-out and sandy areas. Palatability for livestock is fair, cures well on the stem and can provide good fall and winter forage if grazing is deferred during the summer.

IMPROVED VARIETIES

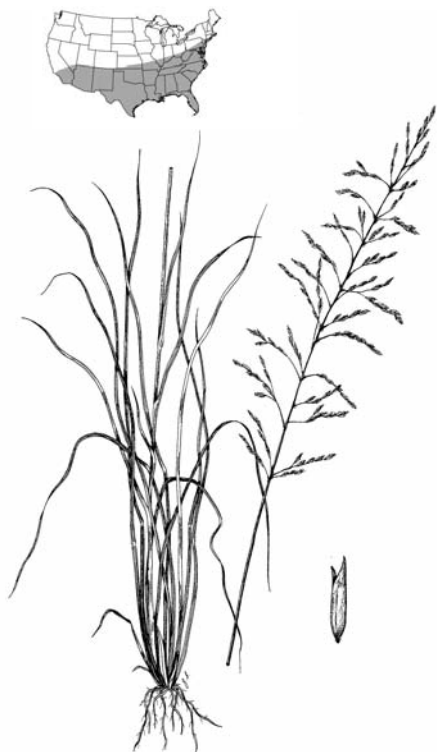
'Bend' released from Kansas

'Mason' released from Texas

'Nebraska 27' released from Nebraska

WEEPING LOVEGRASS

Eragrostis curvula



ORIGIN AND DESCRIPTION

Introduced from South and East Africa. Warm-season, medium sized perennial bunchgrass. Densely tufted with stalks 2 to 4' tall, abundant drooping (weeping) basal leaves 1 to 2' long. Elongated, panicle type inflorescence, 10 to 16" long. Extensive fibrous root system.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Starts growth earlier and matures earlier in the summer than most native warm season grasses. Flowers in late spring and again in late summer or fall. Good regrowth with adequate soil moisture. Does well on fertile sandy to silty texture soils in warm temperate to subtropical, subhumid climates. But will grow on coarse sandy or

clayey soils of lower fertility. Better performance in 20 to 40" ppt. areas, but grows well in 15 to 20" ppt. and less. Tolerant of alkaline and highly acid soils. Sensitive to cold and not adapted to areas of minimum mean temperature below 5° F. Grows from sea level to 7,000' elevation in the Southwest. Tolerant of burning in dormant state or at start of growth in early spring. Moderate shade tolerance.

CULTURE

Drill seed 1/4 - 1/2" deep on most soils conditions. Better stands obtained in areas of high wind erosions by seeding in close stands of sorghum or sudan stubble. Seed in pits, basins or furrows in more arid areas of Southwest. Irrigation and/or supplemental mulching may be beneficial to establish stands. Seeding rate 1 to 2 lbs. per acre. Time of seeding varies with region but should be seeded approximately one month before the most favorable temperature and rainfall for quick germination. February in South and as late as June in the northern limits of adaptation. Protect from grazing until plants are well rooted.

USE AND MANAGEMENT

Primarily use for soil conservation purposes. Ground cover on bare, disturbed, and burned out areas, drainage ways, and erosion control on man-made disturbances such as roadsides, drainage ditches, dikes and areas around airports. Also used for pasture and hay, usually in pure stands. Seedlings need to be protected from weeds and insects. Palatability for livestock fair if grazed early before herbage is six weeks old.

IMPROVED VARIETIES

'Catalina' released from Arizona
'Ermelo' released from Oklahoma
'Morpa' released from Oklahoma
'OTA-S' released from Oklahoma

SPIKE MUHLY

Muhlenbergia wrightii



ORIGIN AND DESCRIPTION

Native to U.S. Occurs in southwestern Colorado, Utah, Arizona, Nevada and New Mexico. Warm season, Tufted Perennial Bunchgrass with large bunches 2 to 2 1/2' diameter. Plants light green with gray to blackish seedheads, seldom over 1 to 1 1/2' tall. Spike heads 2 to 4" long. Short underground stems or reproductive rootstocks found on some plants.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Adapted to wide spectrum of sandy to clayey soils, but most characteristic of sandy or silty soils with 16 to 20" ppt. Tolerant of moist clay to gravelly or rocky sites. It is also found near

springs as well as on dry rocky ridges. Grows scattered in semi-dry meadows, parks, open woodlands, and Ponderosa Pine at 3,800 to 9,000' elevation. Good winter hardiness. Some associated grasses are Sideoats, Blue Grama, and Pine Dropseed (*Blepharoneuron tricholepis*).

CULTURE

Plant seed 1/4" deep on fine-textured to 3/4" on coarse textured soils. Firm seedbed desired. Seed into non-volunteering crop, stubble, or mulch on eroded sites. Plant 1 to 1.5 lbs. PLS per acre. More if broadcasting on bare or harsher sites or for dense, early stands. Seeding dates vary from early to mid-spring, or early July with summer rains.

USE AND MANAGEMENT

Good soil binder, which can be used for revegetation on rangelands, mine lands, construction activities, brush control, and after fires. Palatable to all classes of domestic livestock and utilized by deer and elk throughout the year.

Used in mixtures for conservation work on eroding fields, depleted ranges and bare, eroding, and disturbed fields. New seedlings require weed control with herbicides or mowing. Graze moderately, leave 3 to 6" of stubble to maintain stands. Depleted rangelands may need summer deferment. Should be allowed to mature a seed crop occasionally.

Good palatability in late spring and summer. Fair forage value when mature.

IMPROVED VARIETIES

'El Vado' released from NM and CO

GREEN NEEDLEGRASS

Nassella viridula



ORIGIN AND DESCRIPTION

Native to the northern Great Plains and adjacent areas. Rather tall, cool-season, long-lived, perennial bunchgrass. It grows 18" to 3 1/2' tall with abundant, glossy bright green basal leaves 4 to 12" long. Has a narrow contracted type head 4 to 8" long with a lemma enclosing the caryopsis that has a bent twisted awn about one inch long. Deep fibrous root system.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

One of a few native cool season grasses with a wide range of soil adaptation, especially tolerant

of heavy clays. Adapted to 12 to 20" ppt. but may be found growing in some areas with up to 30" ppt. Starts growth in March and makes most of its vegetative growth in May and June, matures in July. Makes regrowth all summer if moisture is adequate. Thrives on clay soils and fractured shale of bottomlands, less common on sandy and loam soils. It has good drought resistance, but not as good as blue grama and nearly as good as Western Wheatgrass.

CULTURE

Drill 1/2 - 3/4" deep on loam and clayey soils. Drill slightly deeper on sandy soils. Plant 5 to 10 lbs. PLS per acre. Seed quality is usually 90 - 95% purity but only 20 - 30% germinate. Fresh seed should be planted in fall to break dormancy. Seed 2 to 5 years old may be less dormant and easier to get stands from. Increase 50 - 100% if broadcast seeded and on erosive sites. Control weeds in new stands and withhold grazing until stands established. Weeds need to be controlled especially in first 30 to 60 days of growth.

USE AND MANAGEMENT

Used for pasture, hay, and land stabilization, on erosive sandy to clayey soils in northern Great Plains. Seeds eaten by small rodents and songbirds. Often seeded in mixtures with Western Wheatgrass or legumes or both.

It is best not to graze first season. Planned grazing with two months rest every other year, if possible, where warm season grasses are nearby, plan to use them in rotation. Not many disease or insect problems except occasional leaf rust. Moderately palatable, use when plants are still green and after seed drop.

IMPROVED VARIETIES

'Lodorm' released from North Dakota

'Cucharas' released from Colorado, Utah

NEEDLE AND THREAD NEEDLEGRASS

Heterostipa comata



ORIGIN AND DESCRIPTION

Native, widely distributed over the Western U.S. and Great Plains. Erect, leafy, cool-season, long-lived, perennial bunchgrass. Culms 1 to 3' tall with glossy, bright green basal leaves 4 to 12" long. Open panicle head 5 to 10" long with a bent, twisted awn about 4 to 8" long. Extensive deep fibrous root system.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Common on dry, sandy, or gravelly plains, mesas, and foothills, and sometimes even into the mountains 4,000' to 8,500' elevation. Common in

Sagebrush, Juniper/Pinyon and Ponderosa Pine, also on semi desert, and foothills of the Southwest. Grows on shallow soils with 10 to 16" ppt. Starts growth in March and makes most of its vegetative growth by May and matures in June and July. Makes regrowth all summer if moisture is adequate. It has good drought resistance.

CULTURE

Drill seed at 1/2" deep on loam and clay loam soils, slightly deeper on sandy soils. Plant 7 to 14 lbs. PLS per acre. Plant seed in the fall, dormant or very early in the spring before loss of soil moisture. Weeds need to be controlled, especially in first 30 to 60 days of growth. Do not graze the first season, new plantings should not be grazed until well established. Plants should be managed to reach seed maturity every 3 to 4 years to regenerate.

USE AND MANAGEMENT

Used for range forage, hay, and land stabilization. Adapted to light textured soils and used for conservation of erosive sandy soils. Plan grazing with two months rest every other year, if possible; where warm season grasses are nearby, plan to use them in rotation. Moderately palatable to cattle, more so when green and very early in season after seeds drop. Sharp pointed seeds with barbed awns may cause physical injury, especially to sheep. Palatability and forage value may vary by region and season and with varied plant associations. Palatable species can be killed out by overgrazing. Cures rather well and is often utilized in the winter.

IMPROVED VARIETIES

None listed for region

ORCHARDGRASS

Dactylis glomerata



ORIGIN AND DESCRIPTION

Introduced from central and Western Europe as a high yielding good quality forage plant. It is a cool season, leafy bunchgrass 3 to 4' tall. Leaves long, soft and palatable. Head tight panicle 4 to 6" tall. Wide adaptation to subhumid or irrigated conditions.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Best production on medium-textured, well-drained, fertile, calcareous, neutral or medium acid soils, also on alluvial soils moderately fine texture and medium acid to mildly saline. Adapted to irrigated and high rainfall areas

18" ppt. in the intermountain and western states. Shade tolerant. Adapted to high mountain meadows on good soils.

CULTURE

Plant seeds at 1/4 - 1/2" deep, using 1.5 to 3.0 lbs. PLS per acre. Alternate row seeding recommended for pasture and forage production with legumes. Spring planting recommended, especially for irrigated seedings and on soils subject to crusting or frost heaving. Late fall planting satisfactory when planted in clean stubble or fallowed seedbed. Weed control necessary. Heavier seeding rates 4 to 8 lbs. PLS per acre can help to reduce weed competition. Should not be grazed until after first cutting to establish stubble height.

USE AND MANAGEMENT

Major forage grass, excellent for irrigated hay and pastures. Does well in mixtures with Alfalfa and other grasses and legumes. Pasture mixtures must be managed well to maintain Orchard Grass in stands. New plantings should not be grazed until the plants are fully established. A 6" stubble should be maintained for plant vigor. Allow plants to make 10 to 12" growth in the spring before grazing and 4 to 5 weeks regrowth between cuttings or grazing cycles. Very palatable but will not withstand heavy grazing. Good grazing management is needed.

IMPROVED VARIETIES

Forty strains or cultivars are listed in the 1994 Grass Varieties of the United States USDA SCS Handbook 170. Consult with state or local plant materials specialists for varieties best adapted to specific sites and purposes. However, 'Paiute', released from Utah and Idaho has good drought tolerance, and 'Pomar' from Idaho is a low growing selection. These two are different from most other large forage types.

INDIAN RICEGRASS

Achnatherum hymenoides



ORIGIN AND DESCRIPTION

Native widely distributed, cool season, medium-sized bunchgrass and mixed with other grasses in semiarid western U.S. Densely tufted 1 to 2.5' tall with numerous elongated leaves nearly as long as stems. Panicle type head bearing one-flowered spikelets at the end of each branchlet. Short awns, plump seed nearly black at maturity.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Thrives on loose, coarse sands and sandy and silty soils. A pioneer on thin fractured shale and sandstone parent materials as well as many sandy soils. Not too competitive, but very drought resistant. Common in deserts with 6 to 16" ppt. Tolerant of weak salinity and alkalinity but

better on neutral soils. Not tolerant of poorly drained or high water table sites. Does not like shade. Occurs at 2,000 to 10,000' elevation; often local ecotypes best adapted in general region of use.

CULTURE

Drill seed 1 - 2" deep on medium to coarse soils. Cover similarly if broadcast. Seed 5 to 10 lbs. PLS per acre and double if broadcast seeding. On some sites even higher rates may be needed to obtain desired cover. Fall dormant planting helps germination (high seed dormancy). Needs to be planted in non-volunteering stubble in wind erosion areas. Mulching and supplemental irrigation is helpful for rapid soil stabilization. Control weeds and do not graze until plants are well rooted. Plants may be uprooted if grazed too early.

USE AND MANAGEMENT

Used for forage, seeding dry sites and stabilizing sandy soils and mine tailings. Native stands occur in certain sandy and fractured rockland sites of drier areas of Great Plains, Great Basin and Pacific Northwest. These areas may be grazed seasonally or yearlong. Often difficult to obtain low cost seed with high germination. To prolong life of stands, allow plants to reseed occasionally. Moderately graze in winter to maintain good ground cover. Very palatable to livestock and elk.

IMPROVED VARIETIES

'Nezpar' released from Idaho
'Paloma' released from NM and CO
'Rimrock' released from Utah
'Ribbstone' from Canada
'Star Lake' released from Utah
'White River' released from Utah

ANNUAL/ITALIAN RYEGRASS

Lolium perenne ssp. *multiflorum*



ORIGIN AND DESCRIPTION

Major cool season, annual bunchgrass introduced from Europe. Culms erect or decumbent 1 to 2' tall. Foliage is glossy. Spike 3 to 6" long. Growth starts early to midspring, varying with latitude and altitude. Matures in mid to late summer.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Grows principally in the Northwest Pacific coast states, west of the Cascades and as a winter

annual in southern U.S. Subject to winterkill in northern states. No marked soil texture limitation when moisture is abundant, otherwise best on clay loam and loam soils. Tolerant of moderately acidic and nutritionally poor soil.

CULTURE

Seed no deeper than 1/2", preferably shallower on finer textured and moist soils. Cover broadcasted seeding very shallow. Seed may be pressed into soil with a cultipacker. Rates for drill seeding 4 to 8 lbs. PLS per acre. Commonly used rates of 8 to 10 lbs. PLS per acre used for broadcasting seedings with poorer seedbeds and harsh sites. Increase seeding rate to 7 - 9 lbs. per 1,000-sq.ft. for turf grass. Plant early spring or one month before desired germination and seedling growth.

USE AND MANAGEMENT

Used for pastures, hay, silage, cover crop, erosion control, temporary lawn, and over seeding warm season turf grasses in the southern states. Used as winter annual forage in the south. Rapid seedling growth will retard weed invasion. Good palatability to livestock in spring and early summer.

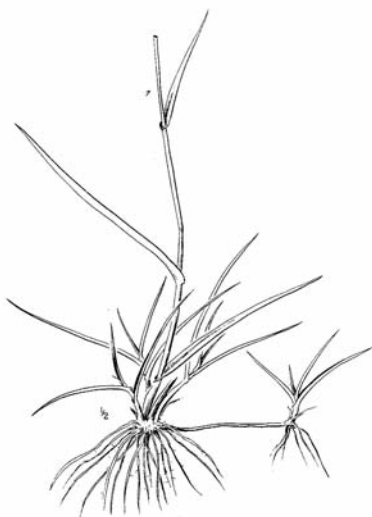
Both forage and turf varieties are available. Seeded with other turf grasses, with or without legumes and provides quick cover with slower developing species.

IMPROVED VARIETIES

Fifteen strains or cultivars are listed in 1994 Grass Varieties of the United States, USDA SCS Handbook 170. Consult with state or local plant materials specialists for varieties best adapted to specific sites and purposes.

PERENNIAL RYEGRASS

Lolium perenne



ORIGIN AND DESCRIPTION

Important cool-season, short-lived, bunchgrass, native to Europe, naturalized in many areas of the U.S. Culms erect or decumbent 1 to 2' tall. Foliage glossy. Spike 3 to 6" long. Starts growth early to midspring, varying with latitude and altitude. Matures in mid to late summer and makes fair volume of fall regrowth in wet sites.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Thrives best in cool moist regions with mild winters, and grows well on heavy soils. No

marked soil texture limitation when moisture is abundant, otherwise best on clay loam and loam soils. Tolerant of moderately acidic and nutritionally poor soil. Tolerant of semi-shaded environments. Moderately competitive and slightly aggressive with weaker turf species.

CULTURE

Seed no deeper than 1/2", preferably shallower on finer-textured and moist soils. Cover broadcasted seed very shallow. Seed may be pressed into soil with a cultipacker. Rates for drill seeding 4 to 8 lbs. PLS per acre. Commonly used rates of 8 to 10 lbs. per acre for broadcasting seeding with poorer seedbeds and harsh sites. Increase seeding rate to 7 to 9 lbs. per 1,000-sq.ft. for turf grass. Plant one month before most favorable conditions for rapid germination and seedling growth. Best times are usually early spring and early fall.

USE AND MANAGEMENT

Used widely for pastures, hay, lawns, golf greens and erosion control. Rapid seedling growth will retard weed invasion. Good palatability to livestock in spring and early summer. Good grazing resistance.

Used in seed mixtures, which include other turf grasses, with or without legumes. Provides quick cover for slower developing species on restoration and disturbed lands.

IMPROVED VARIETIES

Both pasture and turf varieties are available. One hundred and eight strains or cultivars are listed in 1994 Grass Varieties of the United States, USDA SCS Handbook 170. Consult with state or local plant materials specialists for varieties best adapted to specific sites and purposes.

ALKALI SACATON

Sporobolus airoides



ORIGIN AND DESCRIPTION

Native to western U.S. Stout, coarse-leaved, warm-season bunchgrass. Found from Washington and South Dakota south into Mexico. Stalks 1 to 3' tall from large clumps. Makes an open, hummocky sod, but lacking true rhizomes. Base covered by shiny, cream-colored sheaths. Leaf sheaths hairy at summit. Open panicle up to 18" long and spike late not awned.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Thrives on deep, moist subirrigated, sandy to clayey soils in 12 to 18" ppt. zones. Does well

in 8 to 12" ppt. zones especially in lowland sub-irrigated sites. Tolerant of saline and alkali clay soils. Deep densely fibrous root system resistant to erosion. Starts growth mid to late spring or after summer rains in southwest and matures from summer to fall. Fair shade tolerance. Good tolerance of grazing. Moderate fire tolerance. Responds well to irrigation.

CULTURE

Drill seed shallow, 1/4" deep. Cover broadcast seed to same depth or use cultipacker. Minimum of 0.5 to 1.4 lbs. PLS per acre for rangeland and pastures. Increase 50 - 100% if broadcast and erosive sites. Plant seed after soil temperatures are up to 70 to 80° F., especially in disturbed conditions and with the good chance for moisture about 15 days after sowing. Need continuously moist soils during the first 2 to 3 weeks for good establishment. Sometime beneficial on dryland seedings to use pits, basins or furrows that contain moisture. Control weeds in new stands and withhold grazing until stands are established.

USE AND MANAGEMENT

Used for hay, grazing, conservation of eroded soils or mine land reclamation. Sometimes used in mixtures with Western Wheatgrass or Switchgrass. Rotation grazing to maintain approximately 4" stubble. Most nutritious in late spring and summer. Cut for hay in early heading state for best quality. Drag meadows annually to help level lumps for ease of mowing and irrigation. Medium palatability in spring and fair after curing in winter.

IMPROVED VARIETIES

'Wilcox' from southern Arizona

'Salado' released from New Mexico

'Saltalk' release from Texas and Oklahoma

INLAND SALTGRASS

Distichlis stricta



ORIGIN AND DESCRIPTION

Native perennial widespread in the Western US, southern Canada and south to Central Mexico. Warm season, low-growing species that forms dense mats with rhizomes and sometimes stolons. Culms 6 to 12 inches tall. Leaves short flattened and sharp pointed. Seedhead is a panical with short yellowish spikelets. It grows on a wide range of soils, sandy to clayey.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

It is a dioecious species with male and female reproductive parts on separate plants. Makes most growth in early summer. Stays green to late fall. Growth rate is slow. Will tolerate wet saline soils but is also very drought tolerant. Often grows in pure stands.

Inland Saltgrass is found in moist soils that are alkaline or saline. Tolerates irregularly flooded areas, in which the water levels vary between 2 inches above to 6 inches below the soil surface. It is commonly found around dry saline lake beds. It is one of the most drought-tolerant species.

CULTURE

It can be established by seeds or rhizome cuttings. Seeds need moist soil, low alkalinity and high temperatures during establishment. Rhizomes can be planted any time of the year at a depth of 1-2 inches. Rhizome cuttings sprout better at 77-86° F. Rhizome cuttings must not dry out but can be stored up to 28 days in a temperature range of 35-50° F with good humidity.

USE AND MANAGEMENT

Inland Saltgrass is grazed by both cattle and horses during the summer when it is green and during other seasons when it is the only forage available. It may remain green when most other grasses are dry during periods of drought. It is commonly used for winter livestock feed. It is resistant to grazing and trampling. Studies have shown it makes fair pastures when irrigated with saline water. It is one of the few species that grows on highly saline soils and makes good cover for erosion protection.

IMPROVED VARIETIES

Two selections for coastal areas were released from California.

PRAIRIE SANDREED

Calamovilfa longifolia



ORIGIN AND DESCRIPTION

Native of Great Plains and adjacent areas. Coarse, stemmy, warm-season, open sod-former. Grows 2 to 5' tall, stout, scaley, spreading rhizomes. Leaves cauline, pale green to straw colored. Coarsely fibrous root system with rhizomes and effective at sand binding. Large panicle head 6 to 14" long.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Prefers sandy textured soils in overflow, silty and limey upland range sites. Optimal 16 to 20" ppt.,

but also occurs in 10 to 16" ppt. conditions. Strong drought resistance and may replace bluestems in some areas during prolonged drought. Good cold tolerance, but intolerant of high water tables and early spring flooding. Common from about 2,000' in Great Plains and up to 6,000' elevation in Rocky Mountain river valleys and intermountain desert plains. Fire tolerant when dormant.

CULTURE

Drill seed 1" deep in sandy soils and shallower in medium-textured soils. Need special grass drills to handle, hairy, fluffy seeds. If broadcast seeded, cover to approximate same depth. Drill into non-volunteering crop stubble or use seed-hay method of seeding on erosive sites. Drill 4 to 7 lbs. PLS per acre on rangeland. Double rate for broadcasting, or for harsh, erosive, and for sites facing south and west. Seed in early spring or mid-summer before rainy season, but plan enough time for seedlings to be well rooted before winter. Restrict all grazing until plants are well established and rooted.

USE AND MANAGEMENT

Used for stabilization, grazing and hay. Occasionally seeded in warm season grass mixtures on sandy soils. Can establish seed by seed-hay method for stabilizing sandy lands, including "blowouts" and sand dunes. Restrict grazing and manage by moderate, continuous or rotation grazing to maintain cover yearlong. Herbicides may be used for weed control in new stands.

IMPROVED VARIETIES

- 'Goshen' released from Wyoming
- 'Pronghorn' released from Nebraska
- 'Bowman' released from North Dakota
- 'Kock' released from Michigan

GREEN SPRANGLETOP

Leptochloa dubia



ORIGIN AND DESCRIPTION

Native to southwestern U.S. and Florida. Medium tall, warm season, short-lived (essentially biennial) bunchgrass. Wiry erect or spreading stems 2 to 4' tall or more with numerous scabrous, blue-green to dark green leaves 6 to 18" long. Inflorescence an open panicle up to 12" long with drooping branches on 4 to 8" stems.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Thrives on rocky hills and canyons and sandy soils, in southern Florida, Oklahoma and Texas to Arizona. Rarely found naturally on deep sandy soils and deep clays in the Southwest but persistent when planted there. Tolerant of weakly saline and moderately alkaline soils. Starts growth in early April if moisture conditions are favorable.

Intolerant of poorly drained soils or high water tables. May produce late spring or fall seed crops. Seeding success in Texas suggests affinity for calcareous soils. Very drought tolerant and moderately winter hardy, slightly less than Weeping Lovegrass.

CULTURE

Drill or broadcast 1/2 - 3/4" deep. Planting rate 1.7 to 2.5 lbs. PLS per acre in rows for seed or intensively managed pasture. When broadcast on drier, harsher soils and conditions, plant up to 3 lbs. PLS per acre. Plant March to April or August to September in southern plains and June 15 to July 15 in Arizona and New Mexico. Stands are more readily obtained if planted in non-volunteering crop stubble or mulched. Seeds germinate quickly.

USE AND MANAGEMENT

Usually secondary or minor in native stands managed for sustained high production of primary species. Used in conservation mixtures in rejuvenation of fields and native rangelands because of ease of establishment and volunteering. Also used as substitute for Sorghum in highway mixtures due to its rapid germination, good seedling vigor, and less competition to slower developing species. Graze stands moderately, using no more than 50% of current herbage production and also allow 60 to 90 days rest in summer or early fall to allow reseeding.

Mostly used between 2,500 and 6,000' elevation in southern Arizona. Greens up during warm spells in winter in southern plains. Weak shade tolerance and has fair grazing tolerance. Good fire tolerance when dormant. Suitable for inclusion as quick developing element in seeding mixtures used for disturbed land stabilization.

IMPROVED VARIETIES

'Van Horn' released from Texas

BOTTLEBRUSH SQUIRRELTAIL

Elymus elymoides



ORIGIN AND DESCRIPTION

Native to U.S. and widely distributed from eastern Washington to South Dakota, Missouri, Kansas, Texas and California. Bottlebrush Squirreltail is a cool season, short lived, perennial bunchgrass, growing 1 to 2' tall with panicle head and long awns. Found in dry hills, plains, open woods and rocky slopes.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Adapted to wide spectrum of sand to clayey soils and often grows on gravelly soils. Tolerant to saline-alkali soils and has good drought

resistance. Good winter hardiness with local adapted strains and seed sources. Use caution in selecting locations of adaptation of seed sources. Bottlebrush grows in Shadscale Saltbush, Juniper Pinyon, Big Sagebrush, Black Brush, Black Greasewood, Mountain Brush and sub-alpine vegetation zones.

CULTURE

Plant seed 1/4" deep on fine-textured soils, to 3/4" on coarse textured soils with firm seedbed. Seed in non-volunteering crop stubble or mulch needed on eroded sites. Plant 4 to 9 lbs. PLS per acre. Use more seed if broadcasting on bare or harsher sites or for dense, early stands. Seeding dates vary from January to April in southern Great Plains and April 1 to May 15 in central Great Plains and June 15 to July 15 for Trans Pecos and Southwest area. New seedlings require weed control; use herbicides or mowing.

USE AND MANAGEMENT

Used in mixtures or as a monoculture for conservation work on eroding fields, depleted ranges and bare soils in northern and central Great Plains and Southwest. Graze stands moderately and leave 3 to 6" of stubble to maintain stands. Palatable in spring and early summer. Fair forage value when grazed in the late summer and fall at higher elevations after awned seed heads fall. In desert regions it is classed as good fall and winter feed.

IMPROVED VARIETIES

'Sand Hollow' released from Utah
'Fish Creek' released from Utah
'Toe Jam Creek' released from Utah
'Tusas' from New Mexico
'Pueblo' and 'Wapiti' from Colorado

SWITCHGRASS

Panicum virgatum



ORIGIN AND DESCRIPTION

Native in all areas of U.S. except California and Pacific Northwest. Primary species of the mid-west tall grass prairies. Medium-tall, warm season, long-lived, patchy sod grass. Strongly rhizomatous with smooth culms and abundant leaves 2' long. Light blue-green leaf blades wide, flat or folded and has orange colored foliage in the fall. Panicle head 5 to 18" long with spreading branches.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Best adapted to overflow sites especially silty or clayey soils with adequate moisture. Some drought resistance but does best with 16 to 18" ppt. Tolerates early spring flooding and imperfect

drainage conditions, but not too tolerant of high water tables. Winter hardy. Tolerant of moderate salinity or acidity also low pH limit 4 to 4.5. Established stands start growth in late spring and matures in late summer or early fall and has fair regrowth into fall.

CULTURE

Drill or broadcast seed 1/4 - 3/4" deep on firm seedbed; dead litter or mulch recommended when planting. Planting rate 2 to 4 lbs. PLS per acre with grass seed drill using small seed attachment. Light irrigation when possible can speed germination and establishment. Plant in rows for seed or intensively managed pasture. Plant usually March to April in southern Great Plains and April to May in northern Great Plains. New seedlings need protection from grasshoppers and leafhoppers. Also sometimes affected by damping off, seedling blight and rust.

USE AND MANAGEMENT

Used on irrigated and non-irrigated for grazing, hay, wildlife food, and cover. Palatable until headed and has poor palatability in fall and winter. Used for mine soil stabilization and in mixtures with little or big bluestem or Indian grass for pastures. Pure stands of high density may need fertilizer. Selections from Nebraska have been released for biofuel production.

IMPROVED VARIETIES

'Alamo' released from Texas
'Blackwell' released from Kansas
'Caddo' released from Oklahoma
'Cave-In-Rock' released from Missouri
'Dacotah' released from North Dakota
'Grenville' released from New Mexico
'Kanlow' released from Kansas
'Nebraska 28' released from Nebraska
'Pathfinder' released from Nebraska
'Forestburg' released from North Dakota
'Trailblazer' released from Nebraska
'Summer' released from South Dakota
'Sunburst' released from North Dakota

TIMOTHY

Phleum pratense



ORIGIN AND DESCRIPTION

Introduced Eurasian grass. Widely used as a forage plant and naturalized in many areas of northern U.S. and mountainous areas of the western U.S. Small tufted, cool season, short-lived perennial bunchgrass. Culms erect 2 to 3 1/2', uniformly leafy, with swollen bulb-like bases. Leaf blades soft, flat, up to 12" long.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Thrives in deep, fertile, sandy-loamy, and clayey soils in humid areas. Adapted to thin, gravelly, and rocky soils with moisture. Tolerant of winter flooding, but only for a few days during growing season. Best with water table below 6". Generally requires at least 20" ppt. or irrigation

for economic production. Tolerant of weakly acidic to weakly basic soils. Excellent winter hardiness. Grown from sea level to alpine. Good shade tolerance. Fair tolerance to fire when dormant. Good compatibility with legumes and cool season grasses.

CULTURE

Drill seed at 1/4 - 1/2" depth in moist soil, 3/4" deep in drier or coarser textured soil. Cover broadcasted seed shallow or use cultipacker. Drill 1 to 2 lbs. PLS per acre. Increase seeding rate 50-100% for broadcasting, harsh sites, poor seedbed conditions, and wet meadows or for hay crops. Supplemental mulch critical sites. Do not use conventional hydro-mulch methods; seedlings must root in mineral soil. Seed soon after soil disturbance in high mountains. Moderate seedling vigor. Usually well established by second season.

USE AND MANAGEMENT

Prized for horse hay and as a dominant in irrigated mountain meadow mixtures. Used in seeding mixtures for stabilizing roadsides, ski slopes and mining activities. Commonly seeded in mixtures with other meadow species. Produces regrowth in early summer and fall in cooler areas with adequate moisture and fertility. Good palatability.

IMPROVED VARIETIES

There were 25 varieties on the National list. Consult with regional, state, and local plant material specialists for materials adapted and suited to specific sites and purposes. Common varieties in this region:

- 'Champ' released from Canada
- 'Climax' released from Canada
- 'Drummond' released from Canada
- 'Winmor' released by Northrup King Co. Minnesota

ALPINE TIMOTHY

Phleum alpinum



ORIGIN AND DESCRIPTION

Native, short grass, somewhat sod-forming with culms 6 to 24" tall. Occurs in higher elevations and higher latitudes worldwide. Grows in the cooler and higher regions of western U.S. Panicle head is very dense, egg-shaped, 1/2 to 2" long, usually purple. Awned heads give alpine timothy a bristle appearance. The shorter spike-like panicle, wider at base, glumes longer awned, swollen upper sheath and lack of bulb-like bases distinguish Alpine Timothy from common Timothy.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Alpine Timothy is cold tolerant grass occurring in the alpine and subalpine zones. Common in mountain meadows, bogs and wet places. Naturally revegetates somewhat in open or disturbed sites in western mountains. Also grows on relatively well-drained soils and grassy slopes. Good performance in reclamation tests in Montana on alpine mine wastes.

Associated with other moisture loving plants such as Bluegrasses, Tufted Hairgrass, Meadow Sedges, and Rushes, Redtop and Willows.

CULTURE

Plant seed 1/4 - 1/2" deep on coarse textured soils and 1/4" or shallower on fine-textured soils. Better stands obtained on firm seedbed. Drill a minimum of 1 to 2 lbs. PLS per acre for satisfactory stands. Increase rate 50 - 100% for harsh sites, steep open exposures, poorer seedbeds and when broadcasting. Plant seed as soon after disturbance as possible in mountain environment. Mulching is recommended. Protect new seeding from grazing.

USE AND MANAGEMENT

Good palatability to all classes of livestock, elk, and deer. Use in seeding mixtures to revegetate livestock and big game ranges, to protect road, ski slopes, and mined lands. Produces good forage that remains green throughout the summer and valuable as a late season feed.

IMPROVED VARIETIES

None listed for region

BEARDLESS WHEATGRASS

Pseudoroegneria spicata ssp. *inermis*



ORIGIN AND DESCRIPTION

Native to the Intermountain Region. Cool season, long lived, perennial bunchgrass. Similar to Bluebunch Wheatgrass in appearance, but has an open sod-forming habit. Distribution over the same area, but less abundant than Bluebunch. Beardless increases in higher precipitation areas of the intermountain region. Spike head has awnless (or sometimes very short, straight awns) lemmas.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Optimum native stands occur on silty soils of

rolling hills. Stands are fairly common on sandy and clayey soils and even occur on thin, rocky, and gravelly soils. Tolerant of weakly saline soils. Considered for seeding in 10 to 20" ppt. and reported in the 8 to 12" zone in the Great Basin. Intolerant of poor drainage soils and early spring flooding. Drought resistance and forage production better than crested wheatgrasses on drier sites. Good winter hardiness. Elevation range from 500 to 8,000' in the Intermountain West. Moderate tolerance to grazing except in early spring

CULTURE

Drill seed 1/2 - 3/4" deep on loamy, clayey, and sandy soils. Cover broadcasted seed shallow. Drill seeding 5 to 10 lbs. PLS per acre. 50 - 100% more seed for broadcasting and for harsh and south and west facing sites. Fall seedings are most successful.

New seedings require control of weeds and protection from grazing, usually for two growing seasons or until plants head out and are firmly rooted.

USE AND MANAGEMENT

Uses include seeding abandoned croplands, depleted ranges, and bare or disturbed lands. Good palatability for elk, fair palatability to deer. Moderately good palatability to livestock, but reduced during late summer dormancy. Early spring growth and matures 1 to 3 weeks earlier than crested. It becomes semi-dormant in summer, renews growth and makes moderate volume of regrowth in fall with moisture.

IMPROVED VARIETIES

'Whitmar' released from WA, ID and OR

BLUEBUNCH WHEATGRASS

Pseudoroegneria spicata ssp. *spicata*



ORIGIN AND DESCRIPTION

Native of primary importance in intermountain region. Extensive in western Montana to central Washington and south into Nevada and Utah. Cool-season, long-lived, perennial bunchgrass. Variable ecotypes. Culms erect, 1.5 to 4' tall, from medium sized tufts. Leaves primarily basal, narrow, flat, or loosely inrolled blades up to 8" long. Inflorescence a spike 3 to 8" long.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Optimum native stands occur on silty soils. Fairly common on sandy and clayey soils and even on

thin, rocky, and gravelly soils. Tolerant of weakly saline soils. Native stands occur in the 8 to 35" ppt. zone. Considered better adapted for seeding in the 10 to 20" ppt. Intolerant of high water-tables, poor drainage, and early spring flooding. Drought resistance better, greater root and forage production on drier sites than Crested Wheat-grasses. Good winter hardiness but variation among local strains and ecotypes. Elevation range from 500 to 10,000' in the intermountain west.

CULTURE

Drill seed 1/4 - 3/4" deep on loamy, clayey, and sandy soils. Cover broadcasted seed shallow. Drill seeding rates 5 to 10 lbs. PLS per acre. Fifty - 100 % more seed for broadcasting on harsh (south or west) facing sites. Seed late fall or in early spring. Also possible to seed in August and September in areas with good fall moisture or on summer fallowed fields. Shows some promise for revegetating mine spoils. New seedings require weed control and protection from grazing, usually two growing seasons or until plants headed and firmly rooted.

USE AND MANAGEMENT

Uses include seeding abandoned croplands, depleted ranges, and bare or disturbed lands. Moderately good palatability to livestock and wildlife, somewhat reduced during late summer dormancy. Moderate tolerance to grazing except in early spring. Makes moderate volume of regrowth in fall depending on moisture supply.

IMPROVED VARIETIES

'Goldal' released from Idaho and Utah

'Secar' (Snake River Wheatgrass) released from ID, OR, MT, WA, and WY

'Anatone' from Utah and Idaho

'P-7' released from Utah

'Discovery' (Snake River Wheatgrass) ARS release from Utah

'Columbia' germplasm from ARS Utah

CRESTED WHEATGRASS

Agropyron cristatum



ORIGIN AND DESCRIPTION

Introduced from Siberia via Canada. Cool season perennial bunchgrass. Deep, finely branched, fibrous root system. Seedheads (“Crested Wheatgrass complex”) distinctly different from other wheatgrasses. Stalks 1 to 3’ tall with numerous green to dark green, mostly basal leaves. Inflorescence short, dense crest-shaped spike, 1 1/2 to 3” long.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Starts growth early in spring. Matures in early to mid-summer, and becomes semi-dormant until cooler or damper weather. Makes fairly good regrowth in fall with adequate moisture. Thrives on moderately deep and semi-fertile loam soils in cool semi-arid areas. Good drought tolerance and winter hardiness. Adapted to weakly-acidic and moderately-saline soils.

Adapted to 9 to 15” ppt. areas but used in less arid sites with proper management. Altitudes usually 5,000 up to 9,000’ in Arizona and New Mexico and similar areas of other states. Adapted to northern Great Plains.

CULTURE

Seed in firm seed bed 1/4 - 3/4” depth on loams and up to 1” on coarser drier soil. Cover broadcasted seed lightly. Mulching may be beneficial on steep slopes. Seed 3.5 to 8 lbs. PLS per acre on semi-arid land. Plant 50 - 100% more seed for broadcast or mine spoils reclamation and stabilization. Denser seeding usually provides faster cover. Time of planting varies with locality. Seed in fall or early spring, 2 to 4 weeks before most favorable soil moisture and temperature are likely to occur.

USE AND MANAGEMENT

Used for pasture and hay and also for wildlife food and cover, as well as stabilization of roadsides, utility lines, industrial sites and mine reclamation. Weed control needed on new seedlings. Herbicides are more effective than mowing. Stands are more efficiently managed if fenced separately from native rangelands. Spring and fall grazing complements summer use of Great Plains grasslands giving rest during critical growth-cycle periods. Medium palatability when green but less after seeding heads.

Some low growing varieties can be used for low maintenance turf.

IMPROVED VARIETIES

- ‘Ephraim’ released from Utah
- ‘Hycrest’ released from Utah
- ‘Ruff’ released from Nebraska
- ‘Nordan’ released from North Dakota
- ‘Parkway’ released in Canada
- ‘Douglas’ released from Utah
- ‘Hycrest II’ released from Utah
- ‘Roadcrest’ released from Utah
- ‘Fairway’
- ‘Summit’ released from Canada
- ‘NU-ARS AC2’ released from North Dakota

HYBRID WHEATGRASS

Elymus hoffmannii



ORIGIN AND DESCRIPTION

Selected through plant breeding. Advanced-generation hybrid between Quackgrass and Bluebunch Wheatgrass. Natural hybridization has been discovered in Europe. Cool season, long-lived, perennial sod-forming grass. Deep, finely branched, fibrous root system. Seedheads large flattened (crested like) spike 3 to 5" long. Stalks 3 to 4' tall with numerous green to dark green leaves.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Adapted to 13 to 18" ppt or irrigated soils. Starts growth early in spring. Matures in early to mid-summer and may become semi-dormant until cooler or moister weather in fall. Thrives on moderately deep and semi-fertile loam soils in cool semi-arid areas. Good drought tolerance and winter hardiness. Good saline tolerance, about equal to Tall Wheatgrass.

CULTURE

Seed in firm seed bed 1/2 - 3/4" depth on loams and sandy soils but never over 3/4" deep. Seed 1/4" deep on clayey soils. Cover broadcasted seed lightly. Mulching may be beneficial on steep slopes. Seed 10 to 14 lbs. PLS per acre on semi-arid land. Plant more seed for broadcast or irrigated plantings. Plant late dormant fall or very early spring when most favorable soil moisture. After establishment seedlings are vigorous and will survive under harsh conditions.

USE AND MANAGEMENT

Used for good pasture, forage and hay. Recommended for rangeland forage or irrigated and semi-irrigated pastures with moderate saline-alkaline problems. Is more palatable than Intermediate Wheatgrass and stays green longer into the summer. Highly productive.

IMPROVED VARIETIES

'NewHy' released from Utah

'AC Saltlander' released from Canada

INTERMEDIATE WHEATGRASS

Thinopyrum intermedium



ORIGIN AND DESCRIPTION

Native to U.S.S.R. from around the Black Sea and Manchuria. Adapted over most of north-western and western 1/3 of U.S. Introduced for range forage and conservation uses. Cool season, long lived, sod-former. Grows erect 2 to 4' tall with clumped, basal blue-green or green leaves with spreading rhizomes and a massive root system.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Starts growth about the same time as Crested Wheatgrass in spring. Matures later and has

longer growing period. Good summer regrowth and fair fall regrowth with ample moisture. Does best on fine-textured, medium to high fertility soil in cool subhumid climate. Tolerant of moderate saline and weakly acidic soils but needs 15" ppt. Does not withstand overgrazing. Can tolerate early flooding 3 to 5 weeks and water table up to 3' depth.

CULTURE

Drill seed 1/2 - 1" deep and even 1 1/2" in coarser soils. Seed 5 to 15 PLS lbs. per acre, depending on moisture conditions and stand desired. Up to 20 to 25 PLS lbs. per acre for broadcast seeding. Plant early spring or late fall. Can be sodded-in in critical areas. Weed control should be practiced especially in seedling stages. Do not graze until headed and firmly rooted.

USE AND MANAGEMENT

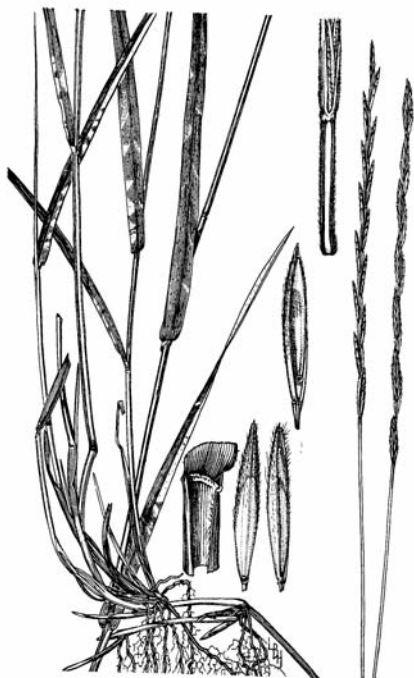
Used widely for forage, hay and pasture. Also used for conservation on disturbed lands, roadways, ditch lands, etc. Palatable to cattle in spring and somewhat palatable in winter. May be used in native mixes with other cool season grasses, legumes, forbs, and shrubs. Good palatability when green, but only fair in winter.

IMPROVED VARIETIES

- 'Amur', released from New Mexico
- 'Greener' released from Washington
- 'Oahe' released from South Dakota
- 'Tegmar', (dwarfed) released from Idaho
- 'Chief' developed in Canada
- 'Rush' released from Idaho
- 'Slate' released from Nebraska
- 'Reliant' released from North Dakota
- 'Beefmaker' released from Nebraska
- 'Clarke'
- 'Manifest' released from North Dakota

PUBESCENT WHEATGRASS

Thinopyrum intermedium



ORIGIN AND DESCRIPTION

Native cool season, long-lived, sod-former from U.S.S.R. Grown over most of northwestern and western 1/3 of U.S. Introduced for range forage and conservation uses. Very similar to Intermediate Wheatgrass but distinguished by dense pubescence on spikes, spikelets and lemmas. Inflorescence long narrow spikes 4 - 6" long.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Adapted to almost same areas as Intermediate Wheatgrass but slightly more tolerant of drought, heat and salt. Does best on fine-textured,

medium to high fertile soil in cool subhumid climate. Also used on sandy and semiarid zones on moist sites. Tolerant of basic and weakly acidic soils and of moderate salinity. Needs 15" ppt. and does not withstand over grazing. Can tolerate early flooding for 3 to 5 weeks and water table up to 3' depth.

CULTURE

Drill seed 1/2 - 3/4" deep and even 1" in coarser soils. Seed 5 to 15 lbs. PLS per acre depending on moisture conditions and stand desired. Increase up to 15 to 25 lbs. PLS per acre for broadcast seeding. Plant early spring or late fall and can be sodded in critical areas. Excellent seedling vigor. Weed control should be practiced especially in seedling stages. Do not graze until headed and firmly rooted.

USE AND MANAGEMENT

Used widely for hay and pasture, also for conservation on disturbed lands, roadways, ditch lands, etc. May be used in native mixes with other cool-season grasses, legumes, forbs, and shrubs. Good palatability when green, but only fair in winter.

Not quite as palatable as Intermediate Wheatgrass. Starts growth about same time in spring as Crested Wheatgrass. Matures late and has longer growing period. Palatable to cattle in spring and somewhat palatable in winter. Fair volume of summer regrowth and good fall regrowth with ample moisture.

IMPROVED VARIETIES

- 'Luna' released from New Mexico
- 'Topar' released from Washington and Idaho
- 'Mandan 759' released from North Dakota
- 'Greenleaf' released from Canada
- 'Manska' released from North Dakota

SIBERIAN WHEATGRASS

Agropyron fragila



ORIGIN AND DESCRIPTION

Introduced from USSR as a forage range grass in western U.S. Cool season, long lived, perennial bunchgrass. Stems blue green. Deep, finely branched, fibrous root system. Seedheads distinctly different to other perennial wheat grasses except those of "Crested Wheatgrass complex." Stalks 1 to 3' tall. Numerous blue-green mostly stem leaves, lax, finer than crested. Inflorescence long narrow flat shaped spike, 1 1/2 to 3" long.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Starts growth early in spring. Matures in early to mid-summer and becomes semi-dormant until

cooler or damper weather. Makes fairly good regrowth in fall with adequate moisture. Thrives on moderately deep and semi-fertile loam soils in cool semi-arid areas. Good drought tolerance and winter hardiness. Adapted to weakly acidic and moderately saline soils. Adapted to 9 to 12" ppt. areas but used in less arid sites with proper management. Altitudes usually 5,000 up to 9,000'. Needs spring moisture. Adapted to northern Great Plains and western U.S.

CULTURE

Seed in firm seedbed 1/4 - 3/4" depth and up to 1" on coarser drier soil. Cover broadcasted seed lightly and mulching may be beneficial on steep slopes. Seed 4.5 to 9.5 lbs. PLS per acre on semi-arid land. Plant 50 - 100% more seed for broadcast or mine spoils reclamation and stabilization. Denser seeding usually provides faster cover. Time of planting varies with locality. Plant in fall or spring when most favorable soil moisture and temperature are likely to occur.

USE AND MANAGEMENT

Used for pasture, hay and for wildlife food and cover. Good for stabilization of roadsides, utility lines, and mine reclamation. Stands are more efficiently managed if separated from native rangelands. Spring and fall grazing complements. Summer use of Great Plains grassland giving rest during critical growth-cycle periods. Medium to good palatability when green; less so after heading. Remains green 10 to 15 days longer than Crested Wheatgrass.

IMPROVED VARIETIES

'P-27' released from Idaho and Washington

'Vavilov' released from Utah

'Stabilizer' released from Utah

'Vavilov II' release from Idaho

SLENDER WHEATGRASS

Elymus trachycaulus



ORIGIN AND DESCRIPTION

Native, cool-season, bunchgrass found throughout the northern Great Plains, northern Rocky Mountains and intermountain regions. Cool-season, short-lived, perennial bunchgrass. Variable ecotypes. Culms erect, 1.5 to 4' tall, from medium sized tufts. Leaves primarily basal, wide flat, blades 8 to 12" long. Inflorescence a spike 3 to 8" long.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Adapted on sandy to clayey soils. Rapid establishing grass with good seedling vigor. Primarily adapted on medium-textured, deep, and well-drained soils in areas of 12 to 18" ppt. Found on

soils and climates associated with Big Sagebrush, Pinyon/Juniper, Mountain Shrub, Open Aspen, and subalpine communities. It is alkali tolerant, relatively short-lived and less drought-resistant than Western Wheatgrass. Seldom found in pure stands. Slender Wheatgrass is self-fertile. Longevity of solid stands is about 4 to 6 years.

CULTURE

Drill 1/2 - 1" deep in fine and medium textured soils. Cover lightly if broadcasted. Seeding rates are 5.5 to 11 lbs. PLS per acre. Use heavier rates when broadcasting or on critical areas. Seed in early spring and late fall, but seeding time can vary from region to region. On ski slopes and mountainous areas, seed following construction. Works well with Mountain Brome, Fescues, and Bluegrass for quick cover on disturbed sites in mountainous regions. Rapid cover will prevent exotic weedy species from invading.

USE AND MANAGEMENT

Principal use is rapid cover for roadsides, disturbed soils, mine lands, and ski slopes. It is also used for forage on rangelands and in mixtures with sweetclover for green manure in short crop rotations. Slender Wheatgrass is sometimes planted alone on land, put into conservation reserve, on watersheds, and on highway fills. Moderately long-lived when planted alone.

Adapted to irrigated pastures and green manure crops with clovers. It is productive and has a growth rate similar to Sweetclover and Red Clover.

IMPROVED VARIETIES

- 'Primar' released from WA, OR, and ID
- 'Pryor' released from Montana and Wyoming
- 'San Luis' released from Colorado
- 'Revenue' released from Canada
- 'Adanac' released from Canada
- 'Copperhead' germplasm from Montana
- 'Charlston Peak' germplasm from ARS Utah
- 'First Strike' released from ARS Utah

STREAMBANK WHEATGRASS

Elymus lanceolatus



ORIGIN AND DESCRIPTION

Native of western U.S., northern Great Plains and western intermountain region of the U.S. Drought-tolerant, cool season, long-lived, perennial sod former. Very similar to western wheatgrass in life form but generally smaller growth form. Single-stemmed to small tufted, about 12" tall, with open spreading rhizomes. Root system dense, fibrous, and has shallow rhizomes. Leaf blades narrow, usually inrolled and scabrous, mostly blue-green. Inflorescence an erect, terminal spike up to 8" long.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Most common on medium to coarse-textured soils, but adapted for seeding on clayey soils.

Moderately tolerant of saline sodic soils. Occurs on well-drained sites with water tables at 3 feet or greater depths. Tolerant of early spring flooding. Moderate shade and grazing-tolerant. Native stands occur in the 8 to 20" ppt. Seeded strains best adapted to the 10 to 18" ppt. Remains green for much of the summer. Low-growing and less of a fire hazard than taller species. Starts growth in spring and matures about 2 weeks earlier than Western Wheatgrass. Makes fair summer and good fall regrowth.

CULTURE

Drill seed 1/4 - 3/4" deep on fine-textured soils and up to 1" deep on coarser soils. Firming seedbeds before seeding is beneficial. Cover broadcasted seed shallow. Supplemental mulch and light irrigation on erosive and droughty sites ensure better establishment. Seed 5.5 to 11 lbs. PLS per acre. Rate should be increased for broadcasting. Seed either in early spring, late fall, or August to September with ample moisture. Seedling vigor for the species is only fair, weaker than Crested and Intermediate Wheatgrass.

USE AND MANAGEMENT

Considered a special-purpose grass, usable chiefly for soil stabilization of disturbed lands, including roadsides, airports, recreation areas, and construction sites with little maintenance. Also used on drier parts of ditches, canals, waterways, and for mine spoils. Widely used for low ground cover. Avoid grazing of seedling stands until they are firmly rooted and headed. Well-adapted in the intermountain area. 'Critana' Thickspike generally outperforms Streambank in the northern Great Plains on sandy soils.

IMPROVED VARIETIES

'Sodar' released from Idaho and Washington

TALL WHEATGRASS

Thinopyrum ponticum



ORIGIN AND DESCRIPTION

Native to Turkey, Asia Minor, Russia, and introduced in U.S. for forage on saline meadows and seashores. Widely adapted in the U.S. A coarse, 4 to 6' tall, cool season Bunchgrass. Rather wide bluish-green leaves with flat or inrolled 1/4" wide, 8 to 16" long. Matures 1 to 3 weeks later than Western Wheatgrass.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Thrives on sandy to clayey soils but less productive on clays or sands. High tolerance of saline, and sodic soils. Moderate fertility needed for good production without legumes.

Adapted to irrigation or subirrigated conditions. Needs about 14" ppt. or more with optimum of 16 to 20" ppt. Tolerates 5 to 7 weeks of early flooding. Good winter hardiness. Does not do well if overgrazed or defoliated. Good fire tolerance when dormant.

CULTURE

Plant seed 1/4 - 3/4" deep, up to 1" deep on coarse-textured soils and up to 1 1/2" on dry and loose seedbeds. Plant approximately 10 lbs. PLS per acre/ dryland and 10 to 20 lbs. PLS per acre on irrigated or subirrigated lands. Seed in early spring; below 4,000' elevation, can seed between Aug. 15 - Sept. 15 in Great Basin and Pacific northwestern states. Seed 2 to 4 weeks before favorable summer ppt. in southern Great Plains. Control weeds with herbicides in early stands. Do not graze until established.

USE AND MANAGEMENT

Used for irrigated pasture, hay, silage, and standing winter feed. Rather palatable early, less palatable after maturity starts. Also used on dryland for re-vegetation in western U.S. for wildlife, especially birds and cover on sodic areas. Used for snow and wind barriers and erosion control. Fair palatability to livestock before heading. Sheep graze in patches. Needs good grazing management for uniform use and production.

IMPROVED VARIETIES

- 'Alkar' released from Washington
- 'Jose' released from New Mexico
- 'Largo' released from New Mexico
- 'Orbit' released from Canada
- 'Platte' released from Nebraska and Wyoming

THICKSPIKE WHEATGRASS

Elymus lanceolatus



ORIGIN AND DESCRIPTION

Native of western U.S. drought-tolerant, cool season, long-lived, perennial sod-former. Very similar to Western Wheatgrass in life-form and appearance. Single-stemmed to small tufted, up to 3' tall, with widely spreading rhizomes. Leaf blades narrow, usually inrolled and scabrous, mostly green but sometimes blue-green. Inflorescence an erect, terminal spike up to 8" long.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Medium to coarse-textured soils, including sandy soils, but considered adapted for seeding on clayey soils. Tolerant of weakly saline soils. Occurs on well-drained sites with water tables at 3' or greater depths, but moderately tolerant

of early spring flooding. Native stands occur in the 6 to 20" ppt. and seeded strains believed best adapted to the 12 to 18" ppt. Wide elevational occurrence, near sea level near Great Lakes to 10,000' in the Wasatch Range.

CULTURE

Drill seed 1/2" deep on fine-textured soils and up to 1" deep on coarser soils. Cover broadcasted seed shallow. Supplemental mulch and light irrigation on erosive and droughty sites ensure better establishment. Use 5 to 10 lbs. PLS per acre seed rate for rangelands. Rate should be increased 50 - 100 % for broadcasting with this species. Drill seed either in early spring, late fall, or late summer-early fall (Aug.-Sept.) with ample moisture. Weeds need to be controlled on new seedings. Avoid grazing of seedling stands until they are firmly rooted and headed.

USE AND MANAGEMENT

Special purpose grass used for soil stabilization of disturbed lands, including roadsides, airports, recreation areas, and construction receiving little maintenance. Also used for drier parts of ditches, canals and waterways, ski slopes and for mine spoils. Palatability good in summer and fair in winter for cattle, good palatability to elk yearlong, but only fair to deer in spring.

Starts growth in spring and matures about 3 weeks earlier than Western Wheatgrass. Makes fair summer and good fall regrowth.

Moderate spring-fall grazing and rotation grazing recommended for ranges in satisfactory condition. Deferred grazing, (only in fall), prescribed to improve ranges in unsatisfactory condition.

IMPROVED VARIETIES

'Critana' released from Montana and Wyoming
'Bannock II' released from ARS Utah
'Schwendemier' from ID, OR, and WA

WESTERN WHEATGRASS

Pascopyrum smithii



ORIGIN AND DESCRIPTION

Native to U.S. and of primary importance of northern Great Plains but occurs in every western state. Widely distributed from Wisconsin to central Washington and south into New Mexico and Texas panhandle. Major range grass in northern and central Great Plains. Medium height cool season, long-lived, coarse-leaf, sod-forming perennial grass. One to 3' tall, with strong spreading rhizomes. Blueish green leaves. Inflorescence a short, stiff spike 2 to 6" long with spikelets tightly overlapping and somewhat flattened with 4 to 10 flowers per spikelet.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Likes fine-textured soils with moderate to higher moisture levels. Will tolerate coarser soils and often planted in the Great Plains. Tolerant of strong soil salinity and to saline sodic soils. Tolerant to poor drainage, water tables to 6" of surface and also of early spring flooding. Generally adapted to 14" to 20" ppt. areas. Grows up to 9,000' elevation.

CULTURE

Drill 1/2 - 3/4" deep in fine and medium textured soils. Cover lightly if broadcasted. Seeding rates 7 to 15 lbs. PLS. Heavier rates when broadcast seeding or on critical areas. Seed in early spring and late fall, but seeding time can vary from region to region.

Control weeds in early part of first growing season with herbicides, skillful grazing management or mowing.

USE AND MANAGEMENT

Used for pasture and hay. Also used in erosion control in conservation practices and in critical area soil stabilization and mine reclamation. Easier managed when seeded alone but may be recommended for use with other grasses not differing greatly in palatability and phenology.

Leave 3 to 4" stubble when grazing to maintain stands. Palatable in early growth stages.

IMPROVED VARIETIES

- 'Arriba' released from CO and NM
- 'Barton' released from Kansas
- 'Rosana' released from MT and WY
- 'Flintlock' released from Nebraska
- 'Mandan 456' released from ND and SD
- 'Rodan' released from North Dakota
- 'Walsh' released from Canada
- 'Recovery' released from Utah

ALTAI WILDRYE

Leymus angustus



ORIGIN AND DESCRIPTION

Native to Siberian Altai Mountains and semi-deserts, steppes and saline soils. Introduced for forage production on salty soils. Winter-hardy, drought-tolerant, long-lived, cool season perennial bunchgrass (occasionally with short rhizomes). Basal leaves long, numerous and relatively coarse textured, but very palatable. Plants 3 to 5' tall, appearance similar to Basin Wildrye. Seed heads 6 to 8" long.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Adapted to moderately deep-to-deep loams and clay loams of the prairies with a minimum of 14 to 18" ppt. Will tolerate saline condition almost as good as Tall Wheatgrass. Growth starts later in the spring than Russian Wildrye. Seed rather large, about 58,000 seeds per lb.

CULTURE

Seed at 1/2 - 1" depth, seed emerges from deeper depth than other small seeded grasses. Drill 15 to 20 lbs. PLS per acre. Seed late fall or as early as possible in spring, April 1 to 15. Weak seedling vigor and less drought resistance in seedling stage, but stands will usually develop by third or fourth season. New established stands should be allowed to mature seed set before grazing. Seedlings develop slowly and a good seedbed and weed control is essential.

USE AND MANAGEMENT

Suited for pasture and range seedings. Consider for summer, fall, and winter forage on saline soils. Retains high nutrient value during summer, fall and into winter. Extends grazing season into fall and winter. Somewhat higher in yield and protein content than Russian Wildrye. Good wildlife cover. May be good streambank stabilizer in dry climates. Roots penetrate 10 to 13' for deep moisture.

IMPROVED VARIETIES

'Prairieland' released from Canada
'Eejay' released from Canada
'Mustang' released from Utah
'Pearl' released from Canada

BASIN WILDRYE

Leymus cinereus



ORIGIN AND DESCRIPTION

Native to the Rocky Mountains, intermountain west region and adjacent areas. Tall, coarse, cool season bunchgrass. Robust, forming large clumps with erect culms 3 to 6' or taller, typically without, but often with, short rhizomes. Leaf blades wide, long, and flat. Inflorescence a stout, stiffly erect spike 8 to 12", sometimes branched. Extensive soil binding, with coarse, fibrous root system.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Adapted to same soils as Tall Wheatgrass. Optimal in silty and clayey soils. Various ecotypes

tolerant of strongly saline and saline sodic soils. Better adapted to winter wet than winter dry climates. Adapted to below 10" to over 20" ppt. Does well in overflow and sub irrigated sites. Tolerant of poor drainage, short-term winter flooding and water table intermittently in top foot of soil. Grows at 1,000 to 9,000' elevation. Starts very early spring growth. Tolerant of partial shade of shrublands and woodlands. Moderate grazing resistance but susceptible to damage from intense early spring grazing.

CULTURE

Similar culture to Tall Wheatgrass. Seed at 1" depth and drill 5 to 10 lbs. PLS per acre. Seed late fall or as early as possible in spring for mountain sites. Fair seedling vigor. Stands establish by second or third season. Not often seeded in mixtures. Fair summer and fall regrowth where subirrigated. Seedlings need moisture for establishment in saline sodic soils.

USE AND MANAGEMENT

Good for spring and fall range-forage, pasture and hay. Species seeded on subirrigated and flooded sites good for standing winter hay. Potentially useful for soil stabilization, disturbed soils and mine lands. Excellent upland game bird cover and emergency winter forage for big game and livestock. Better palatability early in season and good winter forage and cover above snow. Useful as fencerow plantings and field and windbreak borders. Withhold grazing in spring until 12 to 15" high, and leave at least 6" stubble after grazing. Produces high forage yields with irrigation.

IMPROVED VARIETIES

'Manger' released from Idaho

'Trailhead' released from Montana

'Continental' released from Utah

'Tetra' and 'Washoe' germplasm

'Trailhead II' released from ARS Utah

BEARDLESS WILDRYE

Leymus triticoides



ORIGIN AND DESCRIPTION

Native to U.S. at low to medium elevations from Montana to Washington and south to west Texas and California. Medium height cool-season, coarse-leaves, sod-forming perennial. One to 3' tall, strong vigorous spreading rhizomes, up to 6' in one season. Leaves lax, dark green, with fine-stems. Seldom grows in extensive stands. Adapted to a wide range of soil textures and on subirrigated soils.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Adapted to sandy to clay textured soils with moderate to higher moisture levels. Especially tolerant of saline and alkali soils. Will tolerate saline-sodic soils and poorly drained soils with water tables to 6" of surface. Will tolerate also early spring flooding. Generally adapted to 14 to 20" ppt. Grows up to 9,500' elevation in southwestern Colorado.

CULTURE

Seed dormancy requires fall planting. Drill 1/2 - 1" deep in fine and medium textured soils. Cover lightly, if broadcast. Seeding rates 6.5 to 13 lbs. PLS per acre. Increase rates when broadcast or on difficult sites.

USE AND MANAGEMENT

Used for soil stabilization on channel, streams, river slopes, and restoration of mine lands, roads, riparian and range areas. Use for reclamation of saline-seeps, pasture and haylands on wet saline sites.

Native ecotypes perform well on sandy soils at high elevations for mine land restoration and stabilization.

IMPROVED VARIETIES

'Shoshone' released from Montana

'Rio' released from California

BLUE WILDRYE

Elymus glaucus



ORIGIN AND DESCRIPTION

Native to the U.S. and of primary importance to the north-central and western United States. Rapid developing, short-lived, cool season, perennial bunchgrass. Common on cutover or burned lands in the Pacific Northwest. A highly self-fertile, self-pollinated species.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Adapted to soils that range from well to somewhat poorly drained with sandy to clayey textures. Generally prefers moderately acid to neutral soils (pH 5.2 to 7.0). Habitats include openwoods,

prairies, thickets and moist or dry hillsides from sea level to 10,000' elevation.

Exhibits intermediate shade tolerance and full sun to partial shade. Generally abundant on moist soils, some populations are considerably drought tolerant. Extensively differentiated into ecotypes and ecospecies suggesting genetic adaptation to broadly divergent environments. Shade tolerant.

CULTURE

Prefers moist, fine, very firm, weed-free seedbed. Recommended seeding rate is 7 to 13 lbs. PLS per acre when drilled. Seeding depth no greater than 1/2". The seed germinates readily within 6 to 10 days with no special seed treatment required. Spring seeding from late March through early May. Fall seeding has been used but weeds can be a problem, especially annual Bluegrass.

USE AND MANAGEMENT

Fair to good forage for big game and livestock, compatible with tree plantings. Also used to restore native plant communities and rehabilitation of cutover woodlands. As a pioneer species, recommended for quick, self-perpetuating cover. Good native for erosion control on steep, eroded slopes, roadsides, or fire damaged sites.

IMPROVED VARIETIES

- 'Arlington' released from OR and WA
- 'Anderson'
- 'Elkton' released from Oregon
- 'White Pass' germplasm release OR and WA
- 'Union Flat' germplasm release Washington
- 'Copperhead' germplasm from Montana

CANADA WILDRYE

Elymus canadensis



ORIGIN AND DESCRIPTION

Native, stemmy, short-lived, cool season, perennial Bunchgrass. Robust, forming clumps with erect culms 2 to 4' tall with broad, rough basal and stem leaves having large auricles. Tufted with shallow, coarse, fibrous roots, but not strongly competitive. Nodding coarse spikes with awned spikelets. Secondary species in Midwestern prairies reacts as a decreaser. More commonly found in disturbed sites and roadsides. Grows in western Great Plains, Rocky Mountains, intermountain west and eastern U.S.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Adapted to silty and clayey soils. Various ecotypes tolerant of strongly saline and moderate sodic soils. Adapted to below 10" to over 20" ppt. Optimal in overflow and subirrigated sites. Tolerant of poor soil drainage, short-term winter flooding and water table intermittently in top foot of soil.

CULTURE

Similar culture to Tall Wheatgrass. Seed at 1" depth and drill 5 to 10 lbs. PLS per acre. Seed late fall or as early as possible in spring for mountain sites. Very strong seedling vigor, forming stands first year, reaching peak production second and third year then starts thinning. Often seeded in mixtures.

USE AND MANAGEMENT

Sometimes used as rapid cover and site stabilizer in seeding mixtures. Is better to seed in alternate rows with other species. Can be used potentially as a replacement for cereal grains now seeded in some plantings with long-lived perennial mixtures for wildlife and soil stabilization.

Species seeded on sub irrigated and flooded sites. Good for standing winter-feed and cover. Potentially useful for soil stabilization, disturbed soils and mine lands. Excellent upland game bird cover and useful as fencerow plantings and field and stream filters.

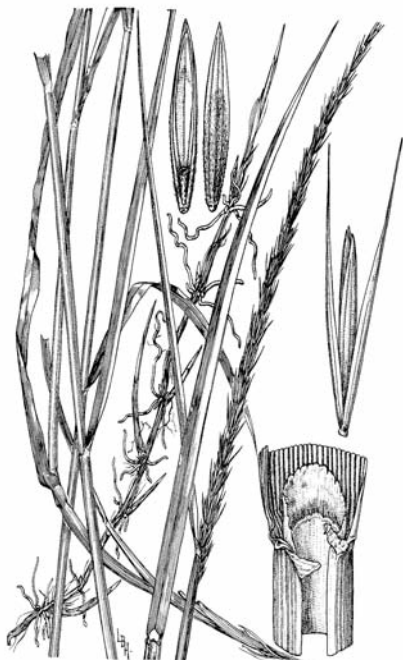
IMPROVED VARIETIES

'Lavaca' released from Texas

'Mandan' released from North Dakota

MAMMOTH WILDRYE

Leymus racemosus



ORIGIN AND DESCRIPTION

Introduced from former USSR for sand dune stabilization. Adapted to the Pacific Northwest, intermountain region, and adjacent areas. Tall, coarse, cool season sod-forming grass. Robust, with stocky large erect culms 2 to 4' tall. Leaf blades wide, long, flat, and stiff. Inflorescence a stout erect spike 8 to 12" tall. Extensive soil binder, short vigorous rhizomes.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Adapted to sand and sandy soils, good drought resistance and moderately tolerant of saline and saline sodic soils. Grows with 8 to 16" ppt. and at 1,000 to 9,500' elevation. Starts earlier spring growth. Reportedly grazed in Wyoming.

CULTURE

Grows from seed or propagated vegetatively. Seed at 1" depth, 13 to 26 lbs. PLS per acre. Seed late fall or as early as possible in spring for mountain sites. Good seedling vigor. Seedlings should be protected from grazing. Mulch is helpful for establishing stands on sandy soils. Established from sprigs on critical sandy sites.

USE AND MANAGEMENT

Recommended for stabilizing inland sand dunes, mine tailings and permanent cover on shallow to deep sands. Relatively coarse and unpalatable, but has been grazed in drought situations. Resistant to blowing sands. Occasionally used for ornamental purposes.

IMPROVED VARIETIES

'Volga' released from Washington

RUSSIAN WILDRYE

Psathyrostachys juncea



ORIGIN AND DESCRIPTION

Introduced from USSR; performs well in northern Great Plains, intermountain, and Rocky Mountain regions. Long-lived, cool season, perennial Bunchgrass. Tufted, basal leafed, superficially resembling Crested Wheatgrass. Short, dense, flat cylindrical spike with two or more short-awned spikelets clustered at axis joints. Extensive fibrous root system. Early spring growth.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Adapted to droughty soils similar to Crested Wheatgrass. Optimal in silty and clayey soils. Tolerant of strongly saline nonsodic soils. Better adapted to winter wet than winter dry climates. Tolerant of summer heat. Adapted to below 8" to over 20" ppt. Not tolerant of winter flooding and shallow water table. Grows at 1,000 to 9,000' elevation. Good grazing resistance but susceptible to damage from repeated early spring grazing. Good summers and fall regrowth when moisture is available.

CULTURE

Similar culture to Crested Wheatgrass. Seed at 1/4 - 3/4" depth and drill 5 to 10 lbs. PLS per acre. Seed late fall or as early as possible in spring for mountain sites. Weak seedling vigor and less drought resistance in seedling stage, but stands will usually develop by third or fourth season. Once established Russian Wildrye is very competitive and will self-thin to spaced bunches. Not often seeded in mixtures.

USE AND MANAGEMENT

Used for range, pasture and hay. Good spring and fall forage. Fair palatability to livestock, deer and elk in spring and fall. Matures earlier than Crested Wheatgrass. Makes good regrowth, stays green all summer with moisture and good fall regrowth. Longevity: 25 years or longer in northern Great Plains.

IMPROVED VARIETIES

- 'Mayak' released from Canada
- 'Vinall' released from North and South Dakota
- 'Bozoisky-Select' released from Utah
- 'Cabree' released from Canada
- 'Mankota' released from North Dakota
- 'Tetracan' released from Canada
- 'Swift' released from Canada
- 'Bozoisky II' released from Utah

VIRGINIA WILDRYE

Elymus virginicus



ORIGIN AND DESCRIPTION

Native, cool season, perennial bunchgrass. Distributed in milder climates throughout most of the U.S. Robust, with culms 3 to 4' tall. Wide flat leaf blades with leaf sheath long, smooth and round on stems. Seed head a nodding spike with awned spikelets.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Grows principally on moist soils in woodlands and along drainage ways that overflow occasionally. Does well on light textured soils that have good internal drainage. Adapted to 24 to over 30" ppt. Optimal in overflow and subirrigated sites. Grows best in 20 - 30% shade.

CULTURE

Plant at 1/2 - 3/4" depth and drill 10 to 20 lbs. PLS per acre. Seed early spring or as early as possible on mountain sites. Good seedling vigor. Often seeded in mixtures with other grasses and forbs.

USE AND MANAGEMENT

Used for forage, roadsides and wildlife seedings. In the South, starts growth in late fall when daily temperatures are 50 to 60° F. Produces seed in May to early June and becomes dormant during hot summer months. Most of the leaves grow widely spaced along the stem rather than from the base of plant. For this reason, Virginia Wildrye is not a high forage producer. However, it is readily grazed by livestock and deer, particularly during fall, winter and spring. Because leaves are easily accessible to all livestock, a deferred grazing system is essential, particularly in late spring and early fall.

Seeded on subirrigated and flooded sites it provides standing winter-feed and cover for wildlife. Many upland birds will eat the seed.

IMPROVED VARIETIES

'Omaha' released from Nebraska

'Kinchafoonee' germplasm from Georgia

'Northern Missouri' germplasm from Missouri

ALFALFA

Medicago sativa



ORIGIN AND DESCRIPTION

Introduced from southwest Asia. Widely utilized in all 50 states. Grows in both cool and warm season. Herbaceous, perennial legume. Numerous erect stems 2 to 3' tall from woody root crowns. Small purple, white and sometimes yellow pea-like flowers. Stout, deep, taprooted with nitrogen-fixing nodules when inoculated. Taproot may be 10 to 30' long. Nitrogen fixing legume.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Resumes growth in early spring. Flowers in early to late summer and makes excellent

regrowth after flowering or cutting. Thrives on deep, fertile, loamy soils having porous subsoil. Tolerant of deep sand and sandy soils with adequate moisture. Well adapted to deep soils with water tables to 5 to 9' of surface. Better adapted to basic soils with liberal calcium content. Acid soils need to be limed. Tolerant of moderately saline soils. Moderately good drought tolerance. Fair shade tolerance. Grown from below sea level in Imperial Valley, California, to 8000' elevation in Colorado. Good fire resistance when dormant.

CULTURE

Drill or broadcast seed 1/4 - 1/2" deep on loamy to sandy soils with firm, moist seedbeds, slightly deeper on drier, sandy or loose seedbeds. Seed often blown on in some areas. Seed 6 to 10 lbs. PLS per acre. Use 8 to 16 lbs. PLS per acre for broadcast seeding in harsh, erosive conditions or more humid zones. Reduce seeding rate in grass mixtures to prevent bloat in pastures. Seed in spring or late summer to fall under irrigation. Needs 30 days after germination before the first frost. New seedlings require weed control and protection from grazing.

USE AND MANAGEMENT

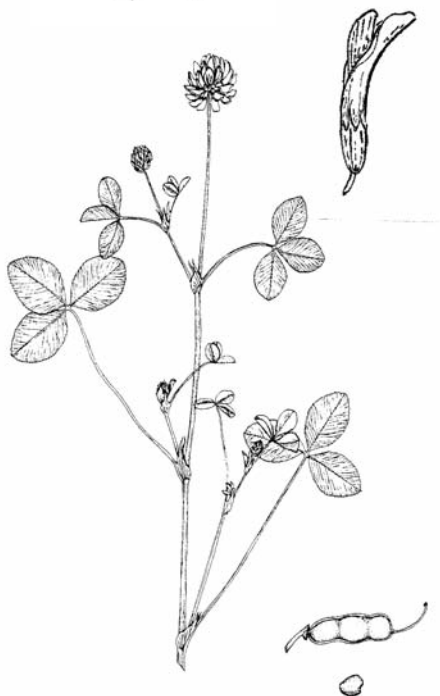
Produces excellent hay and pasture alone or in mixtures. Used on mined lands and wildlife cover. Can induce bloat in ruminants, but correctable by management and supplements. Harvest at approximately 1/10 bloom for optimal quality/quantity. Graze conservatively in a rotation plan. Leave 10" growth preceding first killing frost. May need insect control at times.

IMPROVED VARIETIES

Numerous varieties and cultivars. Consult the local agricultural specialist in your area.

ALSIKE CLOVER

Trifolium hybridum



ORIGIN AND DESCRIPTION

Introduced from Europe. Short-lived, perennial or biennial herbaceous legume. Trifoliate leaves with tillering roots and smooth prostrate to ascending stems. Flowering inflorescence that bear pink and white blossoms in dense, globose shaped head. Nitrogen fixing legume.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Adapted to medium to heavy clay soils and tolerant of acid to alkaline soils on wet sites. Naturally escapes in wet sites (road borrow pits

and along drainages) suggesting utility. Shorter lived and provides less cover and soil binding than White Clover in most situations. Starts growth in early to mid-spring or later in higher elevations and altitudes. Flowers in May to July or all summer long in cooler, moister areas.

CULTURE

Drill or broadcast seed. Cover 1/4 - 1/2" deep in a firm well-prepared seedbed. If mixed with grass, drill in alternate rows if feasible. Drill 6 to 8 lbs. PLS per acre. Seed with grass mixture in humid areas or under irrigation. Use about 4 to 6 lbs. PLS per acre in grass mixtures on dryland western sites. Plant in spring or late fall in cooler climates. Late summer seedings are satisfactory in warm temperate and southern climates with adequate moisture or irrigation. Inoculate seed before planting. Protect from overgrazing and weeds in first year. Fertilize based on soil test deficiencies, especially phosphates.

USE AND MANAGEMENT

Important forage for hay, pasture, and useful for stabilizing disturbed and eroding land, including roadsides and mine spoils. Best used with Timothy, Meadow Foxtail and Red Clover in wet meadows or under irrigation. Good palatability for livestock, especially in summer. Seeds are consumed by a variety of birds. May occasionally cause bloat in ruminants. Contains estrogen that can cause animal reproductive problems.

Should graze or defoliate grasses moderately close during rapid grass growth stages to allow clover to compete.

IMPROVED VARIETIES

Consult with plant materials specialists for material adapted to your area.

RED CLOVER

Trifolium pratense



Red clover

ORIGIN AND DESCRIPTION

Introduced from Europe but widely used and distributed in U.S. A biennial or short-lived perennial, herbaceous legume. Usually taller than wild White Clovers. Tufted without stolons, but with larger, oblong, hairy leaflets, white- blotched in center, and having larger rose-purple flower heads. Usually prostrate growth but can be erect. Nitrogen fixing legume.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Thrives in cool and humid or irrigated areas and is less drought-tolerant than alfalfa. Grows on

fertile, well-drained soils with high moisture holding capacity. Better adapted on medium to fine-textured soils. Tolerant of moderately acid to neutral soils. Better performance with pH 6.0 or less. Not tolerant of salinity. Usually requires good soil phosphate content for best production.

CULTURE

Drill or broadcast seed, cover 1/4 - 1/2" deep in a firm well-prepared seedbed. If mixed with grass, drill in alternate rows, if feasible. Drill seed 3 to 6 lbs. PLS per acre. Seed in grass mixture in humid areas or under irrigation. Use about 1.5 lbs. PLS per acre in grass mixtures on dryland western sites. Can be seeded in spring in northern areas or early fall in southern areas. Late summer seedings are satisfactory with adequate moisture or irrigation. Inoculate seed before planting. Protect from overgrazing and weeds in seeding year. Strong seedling vigor.

USE AND MANAGEMENT

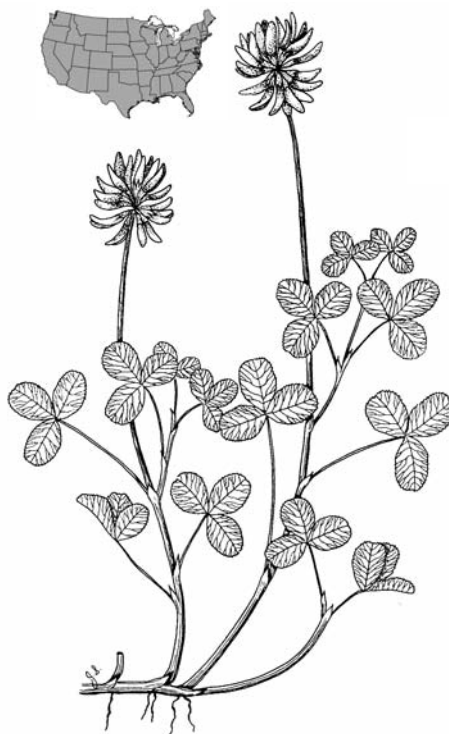
Commonly used in short rotation hay crops, but included in some irrigated or humid pasture mixtures for its quick, short-term establishment. Useful in surface mine land reclamation for contributions of Nitrogen fertility and diversity in wildlife plantings. Inadequate winter cover seeded alone and needs to be seeded with long-lived perennial grasses. Good palatability to livestock, especially in summer. Seeds consumed by a variety of birds. May occasionally cause bloat in ruminants and contains estrogen that can cause animal reproductive problems.

IMPROVED VARIETIES

'Kenland', 'Redland', 'Arlington' and 'Mammoth' Several other cultivars and varieties exist. Consult with plant materials specialists for material adapted to your area.

WHITE CLOVER

Trifolium repens



ORIGIN AND DESCRIPTION

Introduced from Eurasia, widely used and distributed in U.S. Perennial, herbaceous legume. Usually prostrate but can be erect. Stems freely branching from base, stoloniferous, rooting at nodes. Nearly round flowering head with many small pea-like flowers. White or pinkish petals producing 4 to 5 seeds per pod. Nitrogen fixing legume.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Many small prostrate types but also large upright tall and intermediate types. Initially produces a tap root but later replaced by finer branched roots. Resumes growth in early to mid-spring or later in higher elevations and

altitudes. Flowers in May to July or all summer long in cooler, moister areas. Become semi-dormant, under hot, dry conditions with abundant regrowth in summer and less in fall.

CULTURE

Drill or broadcast seed. Cover 1/4 - 1/2" deep in a firm well-prepared seedbed. Plant in alternate rows with grasses if feasible. Drill 2.5 lbs. PLS per acre in grass mixture in humid areas or under irrigation. Use about 1.5 lbs. PLS per acre in grass mixtures on dryland western sites. Plant in spring or late fall in cooler climates. Late summer seeding satisfactory in warm temperate and southern climates with adequate moisture or irrigation. Inoculate seed before planting. Protect from overgrazing and weeds in seeding year. Fertilize to amend tested soil deficiencies, especially phosphates.

USE AND MANAGEMENT

Important for pasture and useful for stabilizing disturbed and eroding land surfaces, including roadsides and mine spoils. Included in grass forb mixtures and wildlife plantings. Also used in lawns and turf plantings

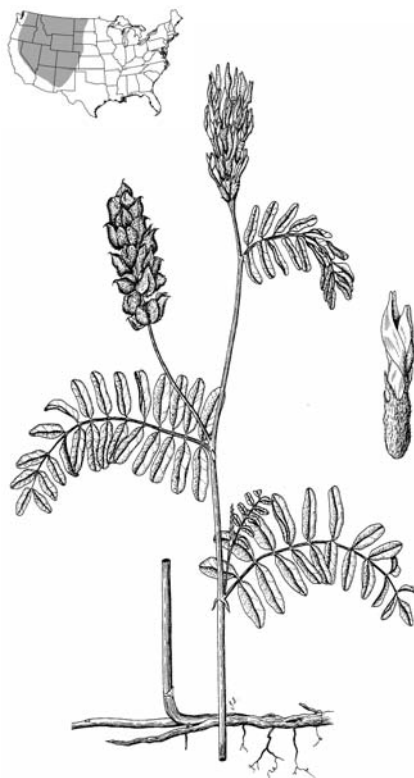
Good palatability to livestock, especially in summer. Seeds consumed by a variety of birds. May cause bloat occasionally in ruminants and contains estrogen that may cause animal reproductive problems. Used for inter-seeding and over-seeding depleted or renovated bluegrass or other mostly cool season pasture. Should graze or defoliate grasses moderately close during rapid grass growth stages to allow clover to compete.

IMPROVED VARIETIES

Several cultivars of the large 'Ladino' and a variety of sources of small and intermediate varieties exist. Consult with plant materials specialists for material adapted to your area.

CICER (CHICKPEA) MILKVETCH

Astragalus cicer



ORIGIN AND DESCRIPTION

Introduced from Eurasia. A spreading, warm season, herbaceous, perennial legume. Stems large, succulent, decumbent, usually less than 3' tall. Vigorous, creeping rhizomes and a short tap root. Leaves 4 to 8" long, odd-pinnate, with 21 to 27 leaflets. Inflorescence a contracted raceme with 15 to 60 pea-like pale yellow to white flowers.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Grows in moist grasslands, open woodlands, flood drainage, and meadows. Well adapted to all soil textures from clays to sands but best performance on loam to sandy loam soils derived from limestone. Better performance than Alfalfa on thin foothill soils and on wet and higher

altitude sites. Tolerant of weakly acidic to alkaline soils. Reported on wet sites with pH of 9.8. Tolerant of subirrigation with water tables within 3' of surface. Established stands show good drought tolerance, but seedlings are more sensitive. Generally need 15" ppt. or light irrigation. Good winter hardiness. Thrives at 10,000' elevation.

CULTURE

Drill seed 1/2 - 3/4" deep in a well prepared, firm seedbed. Use 6 to 12 lbs. PLS per acre for drill seedings and 5 lbs. PLS per acre for mixtures with grass. Double the rate for critical area stabilization and for harsh sites. Scarify seed just before planting unless fall seeded. However, scarified seeds lose viability quickly in storage. Inoculate seed just before seeding. Plant early spring or late fall and can plant later spring with irrigation. Seedling vigor rates good with irrigation but only fair under dryland conditions due to slow rate of growth. Control weeds and withhold grazing on seedling stands.

USE AND MANAGEMENT

Recommended for high elevation meadows, irrigated pastures, hay, and lower dryland areas. Use in grass mixtures for stabilizing critical areas (pond or canal banks, spillways, road cuts and fills, mine spoils) and as erosion control cover crop. Palatable to livestock, elk, deer, and antelope. Somewhat less palatable than Alfalfa but non-bloating, nontoxic and N-fixation. Starts growth about 2 weeks later than Alfalfa. Good summer and fair amount of fall regrowth with available moisture. Irrigated stands may attain mature growth second year. Dryland seedlings may take 3 years to develop full stands.

IMPROVED VARIETIES

'Lutana' released from Wyoming and Montana

'Monarch' released from Colorado

'HiPal' released from Minnesota

SAINFOIN

Onobrychis viciaefolia



ORIGIN AND DESCRIPTION

Introduced from Eurasia. Cool season, short-lived, perennial, non-bloating, legume. Stems semi erect, 1 to 3' tall. Leaves pinnately compound with 11 to 27 elliptic to lance-shaped leaflets. Numerous showy pink to purple pea-like flowers borne in racemes. Deep taproot with several large and many fine laterals. Nitrogen fixing.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Thrives on deep, fertile, sandy to silty textured well-drained soils. Good performance on calcareous soils and moderately tolerant of saline and weakly acidic soils. Not productive on

shallow soils. Needs 16 to 20" ppt., but grows moderately well in cooler areas with over 13" ppt. Often short-lived in heavy textured soils. Good with irrigation and cool season grass mixtures where water is limited. Growth resumes earlier than alfalfa. More winter hardiness but less drought resistance than Alfalfa.

CULTURE

Plant seed 1/2 - 1" deep. Seed 25 lbs. PLS per acre on dryland or 35 lbs. PLS per acre under irrigation. Reduce seeding rates 40 - 50 % when planting in mixtures. Good seedling vigor. Usually better stand establishment and longevity when seeded with grass in alternate rows 12 to 24" spacing. Plant in early spring and where feasible on fallowed land. Late spring or early summer seeding satisfactory with irrigation. Inoculate with specific inoculum before planting. Weed control and grazing protection are required.

USE AND MANAGEMENT

Recommended for dryland or irrigated hay or pasture, especially in the northern intermountain and northwestern Great Plains. Multiple cuttings for hay under irrigation, but usually one cutting on dryland. Performance good with cool season grasses and Birdsfoot Trefoil for irrigated hay and forage system. Palatable and nutritious to livestock, and wildlife. Do not over graze, allow good regrowth before grazing. Often overgrazed by livestock and big game. Extremely palatable to deer.

Crown and root rot pathogens limit production and causes stand thinning. More prevalent with irrigated stands.

IMPROVED VARIETIES

- 'Eski' released from Montana
- 'Remont' released from Montana
- 'Melrose' released from Canada
- 'Renumex' released from New Mexico
- 'Shoshone' released from WY and MT
- 'Delaney' released from WY and MT

YELLOW SWEETCLOVER

Melilotus officinalis



ORIGIN AND DESCRIPTION

Introduced from Eurasia and found in all states. Biennial, cool season, legume. First season growth forms one leafy-branched central stem. Fleshy roots, with buds on slightly sunken crowns. Second years growth forms well branched stems 2 to 6' tall. Leaves trifoliate with dentate margins. Inflorescence includes numerous elongated, loose racemes with small, pea-like yellow flowers bearing, small one-seeded pods, which mature and shatter early. Nitrogen fixing.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Tolerant of all soil textures and varying from saline/alkaline to weakly acidic, pH of 5.5 soils. Thrives in regions over 14" ppt. May be found in much drier areas under certain conditions.

Vigorous invader naturalizing in road cuts or borrow pits. Weakly shade-tolerant, good drought resistance. Tolerates some flooding. Some fire tolerance when dormant.

CULTURE

Culture very similar to Alfalfa. Use scarified seed. Plant 3 to 6 lbs. PLS per acre for full stands in semi-arid zones and up to double the amount of seed in more sub-humid zones. Plant only 1/2 to 2 lbs. per acre on rangeland mixtures in order to minimize bloat hazard. Be sure to inoculate seed. Plant seeds 1/2 to 1" deep but can go a little deeper on lighter and drier soils. Plant in late fall to early spring in plains and foothills. Seeds germinate within 7 to 10 days except hard seed.

USE AND MANAGEMENT

Palatable to livestock and big game in vegetative stages and well used by small mammals and birds. Contains coumarin, which causes a bleeding disease in livestock. Widely used for temporary pasture, hay and silage. Provides quick cover on disturbed lands. Graze conservatively the first year to allow carbohydrate storage in roots. Graze leaving 8 to 10" growth the 2nd year. Graze rather heavily during growth period to keep from becoming stemmy and unpalatable.

IMPROVED VARIETIES

- 'Madrid' released from Spain
- 'Goldtop' developed in Wisconsin
- 'Yukon' released from Canada
- 'Evergreen' white sweet clover from Ohio
- 'Norgold' and 'Polara' from Canada

BIRDSFOOT TREFOIL

Lotus corniculatus



ORIGIN AND DESCRIPTION

Native to Europe. Used on shallow moist soils. Cool season, long-lived, perennial legume. Stems succulent, decumbent or erect, usually 1 to 2' tall with moderately-deep roots. Leaves trifoliate, narrow with large stipules. Inflorescence a loose raceme with yellow flowers. Nitrogen fixing.

GROWTH HABITS AND ENVIRONMENTAL PREFERENCES

Well adapted to shallow silty to clayey soil textures. Better performance than Alfalfa on thin foothill soils and on wet and higher altitude sites. Tolerant of moderate acidic soils and water tables within 3' of surface. Generally need 18" ppt. or irrigation for satisfactory stand establishment and production. Good winter hardiness and thrives at high altitudes.

CULTURE

Plant 1/2 - 3/4" deep in a well-prepared, firm seedbed. Use 3 to 6 lbs. PLS per acre for drill seedings and 2 lbs. PLS per acre for mixtures with grass. Double the rate for critical areas and for harsh sites. Scarify seed just before planting unless fall seeded. Scarified seeds can lose viability quickly. Inoculate seed just before seeding. Plant early spring or late fall and can plant in the spring with irrigation.

Only fair seedling vigor due to poor emergence and slow growth. Difficult to establish in mixtures with vigorous grasses. Seed in alternate rows to reduce competition. Control weeds and withhold grazing on new stands.

Successfully established in mountain meadows by suppressing the existing vegetation with herbicide and interseeding.

USE AND MANAGEMENT

Adapted on soils too shallow or wet for Alfalfa. Recommended for pastures and hay on irrigated or dryland areas receiving over 18" ppt. Good palatability to livestock and big game; non-bloating. Will not persist in pastures unless rotation grazed. Allow 4-week regrowth period and; leave a 4" stubble for winter. Well-suited for use with Orchard Grass, tall fescue and Timothy inter-seeding mountain meadows.

IMPROVED VARIETIES

'Cascade' released from Washington

'Kalo' released from Oregon and Washington

Other releases:

'Dawn', 'Empire', 'Leo', 'Carroll', 'Norcen', 'Tretana', 'Viking', 'Mansfield', 'Mackinaw', and 'Granger'

Reference Tables



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PAST SCIENTIFIC NAME cross reference Table 1

GRASSES

Common Name		Current Scientific Name	Past Scientific Name	Page
Wheatgrass	Crested	<i>Agropyron cristatum</i>	<i>Agropyron cristatum</i>	75
Wheatgrass	Thickspike	<i>Elymus lanceolatus</i>	<i>Agropyron dasystachyum</i>	83
Wheatgrass	Tall	<i>Thinopyrum ponticum</i>	<i>Agropyron elongatum</i>	82
Wheatgrass	Beardless	<i>Pseudoroegneria</i> <i>spicata</i> ssp. <i>inermis</i>	<i>Agropyron inerne</i>	73
Wheatgrass	Intermediate	<i>Thinopyrum intermedium</i>	<i>Agropyron intermedium</i>	77
Wheatgrass	Hybrid	<i>Elymus hoffmannii</i>	<i>Agropyron repens</i> x <i>A.spicata</i>	76
Wheatgrass	Streambank	<i>Elymus lanceolatus</i>	<i>Agropyron riparium</i>	81
Wheatgrass	Siberian	<i>Agropyron fragila</i>	<i>Agropyron sibiricum</i>	79
Wheatgrass	Western	<i>Pascopyrum smithii</i>	<i>Agropyron smithii</i>	84
Wheatgrass	Bluebunch	<i>Pseudoroegneria</i> <i>spicata</i> ssp. <i>spicata</i>	<i>Agropyron spicatum</i>	74
Wheatgrass	Slender	<i>Elymus trachycaulus</i>	<i>Agropyron trachycaulum</i>	80
Wheatgrass	Pubescent	<i>Thinopyrum intermedium</i>	<i>Agropyron trichophorum</i>	78
Bentgrass	Redtop	<i>Agrostis gigantea</i>	<i>Agrostis alba</i>	12
Bentgrass	Creeping	<i>Agrostis stolonifera</i>	<i>Agrostis alba</i> var. <i>stolonifera</i>	11
Bentgrass	Colonial	<i>Agrostis capillaris</i>	<i>Agrostis tenuis</i>	10
Foxtail	Creeping Meadow	<i>Alopecurus arundinaceus</i>	<i>Alopecurus arundinaceus</i>	47
Bluestem	Caucasian	<i>Bothriochloa blaichii</i>	<i>Andropogon caucasicus</i>	25
Bluestem	Big	<i>Andropogon gerardii</i>	<i>Andropogon gerardii</i>	24
Bluestem	Sand	<i>Andropogon hallii</i>	<i>Andropogon hallii</i>	27
Bluestem	Yellow	<i>Bothriochloa ischaemum</i>	<i>Andropogon ischaemum</i>	28
Bluestem	Little	<i>Schizachyrium scoparium</i>	<i>Andropogon scoparium</i>	26
Grama	Sideoats	<i>Bouteloua curtipendula</i>	<i>Boutelou curtipendula</i>	51
Grama	Black	<i>Bouteloua eriopoda</i>	<i>Boutelou eriopoda</i>	49
Grama	Blue	<i>Bouteloua gracilis</i>	<i>Boutelou gracilis</i>	50
Brome	Meadow	<i>Bromus biebersteinii</i>	<i>Bromus biebersteinii</i>	30
Brome	Smooth	<i>Bromus inermis</i>	<i>Bromus inermis</i>	32
Brome	Mountain	<i>Bromus marginatus</i>	<i>Bromus marginatus</i>	31
Buffalograss		<i>Bouteloua dactyloides</i>	<i>Buchloe dactyloides</i>	33
Sandreed	Prairie	<i>Calamovilfa longifolia</i>	<i>Calamovilfa longifolia</i>	67
Bermudagrass		<i>Cynodon dactylon</i>	<i>Cynodon dactylon</i>	13
Orchardgrass		<i>Dactylis glomerata</i>	<i>Dactylis glomerata</i>	61
Hairgrass	Tufted	<i>Deschampsia cespitosa</i>	<i>Deschampsia cespitosa</i>	52
Saltgrass	Inland	<i>Distichlis stricta</i>	<i>Distichlis stricta</i>	66
Wildrye	Canada	<i>Elymus canadensis</i>	<i>Elymus canadensis</i>	89
Wildrye	Basin	<i>Leymus cinereus</i>	<i>Elymus cinereus</i>	86
Wildrye	Mammoth	<i>Leymus racemosus</i>	<i>Elymus giganteus</i>	90
Wildrye	Blue	<i>Elymus glaucus</i>	<i>Elymus glaucus</i>	88
Wildrye	Russian	<i>Psathyrostachys juncea</i>	<i>Elymus junceus</i>	91
Wildrye	Beardless	<i>Leymus triticoides</i>	<i>Elymus triticoides</i>	87
Wildrye	Virginia	<i>Elymus virginicus</i>	<i>Elymus virginicus</i>	92
Lovegrass	Weeping	<i>Eragrostis curvula</i>	<i>Eragrostis curvula</i>	57
Lovegrass	Sand	<i>Eragrostis trichodes</i>	<i>Eragrostis trichodes</i>	56

PAST SCIENTIFIC NAME cross reference Table 1

GRASSES

Common Name		Current Scientific Name	Past Scientific Name	Page
Fescue	Arizona	<i>Festuca arizonica</i>	<i>Festuca arizonica</i>	38
Fescue	Tall	<i>Schedonorus arundinaceus</i>	<i>Festuca arundinacea</i>	46
Fescue	Alpine	<i>Festuca brachyphylla</i>	<i>Festuca brachyphylla</i>	37
Fescue	Idaho	<i>Festuca idahoensis</i>	<i>Festuca idahoensis</i>	42
Fescue	Hard	<i>Festuca brevipila</i>	<i>Festuca ovina</i> var. <i>duriuscula</i>	41
Fescue	Rocky Mountain	<i>Festuca saximontana</i>	<i>Festuca ovina</i> var. <i>saximontana</i>	43
Fescue	Sheep	<i>Festuca filiformis</i>	<i>Festuca ovina</i> var. <i>ovina</i>	45
Fescue	Creeping Red	<i>Festuca rubra</i> ssp. <i>arenaria</i>	<i>Festuca rubra</i>	40
Fescue	Chewing	<i>Festuca rubra</i> ssp. <i>fallax</i>	<i>Festuca rubra</i> var. <i>commutata</i>	39
Fescue	Rough	<i>Festuca campestris</i>	<i>Festuca scabrella</i>	44
Galleta	James'	<i>Paronychia jamesii</i>	<i>Hilaria jamesii</i>	48
Junegrass	Prairie	<i>Koeleria macrantha</i>	<i>Koeleria cristata</i>	54
Sprangletop	Green	<i>Leptochloa dubia</i>	<i>Leptochloa dubia</i>	68
Wildrye	Altai	<i>Leymus angustus</i>	<i>Leymus angustus</i>	85
Ryegrass	Annual/Italian	<i>Lolium perenne</i> ssp. <i>multiflorum</i>	<i>Lolium multiflorum</i>	63
Ryegrass	Perennial	<i>Lolium perenne</i>	<i>Lolium perenne</i>	64
Muhly	Spike	<i>Muhlenbergia wrightii</i>	<i>Muhlenbergia wrightii</i>	58
Ricegrass	Indian	<i>Achnatherum hymenoides</i>	<i>Oryzopsis hymenoides</i>	62
Kleingrass		<i>Panicum coloratum</i>	<i>Panicum coloratum</i>	55
Switchgrass		<i>Panicum virgatum</i>	<i>Panicum virgatum</i>	70
Canarygrass	Reed	<i>Phalaris arundinacea</i>	<i>Phalaris arundinacea</i>	35
Timothy	Alpine	<i>Phleum alpinum</i>	<i>Phleum alpinum</i>	72
Timothy		<i>Phleum pratense</i>	<i>Phleum pratense</i>	71
Bluegrass	Alpine	<i>Poa alpina</i>	<i>Poa alpina</i>	14
Bluegrass	Sandberg	<i>Poa secunda</i>	<i>Poa ampla</i>	23
Bluegrass	Annual	<i>Poa annua</i>	<i>Poa annua</i>	15
Bluegrass	Bulbous	<i>Poa bulbosa</i>	<i>Poa bulbosa</i>	16
Bluegrass	Canby	<i>Poa secunda</i>	<i>Poa canbyi/sandbergii</i>	18
Bluegrass	Canada	<i>Poa compressa</i>	<i>Poa compressa</i>	17
Bluegrass	Glaucous	<i>Poa glauca</i> ssp. <i>glauca</i>	<i>Poa glaucantha</i>	20
Bluegrass	Fowl	<i>Poa palustris</i>	<i>Poa palustris</i>	19
Bluegrass	Kentucky	<i>Poa pratensis</i>	<i>Poa pratensis</i>	21
Bluegrass	Rough	<i>Poa trivialis</i>	<i>Poa trivialis</i>	22
Alkaligrass	Weeping	<i>Puccinellia distans</i>	<i>Puccinellia distans</i>	9
Bristlegrass	Plains	<i>Setaria vulpiseta</i>	<i>Setaria macrostachya</i>	29
Squirreltail	Bottlebrush	<i>Elymus elymoides</i>	<i>Sitanion hystrix</i>	69
Indiangrass	Yellow	<i>Sorghastrum nutans</i>	<i>Sorghastrum nutans</i>	53
Cordgrass	Prairie	<i>Spartina pectinata</i>	<i>Spartina pectinata</i>	35
Sacaton	Alkali	<i>Sporobolus airoides</i>	<i>Sporobolus airoides</i>	65
Dropseed	Sand	<i>Sporobolus cryptandrus</i>	<i>Sporobolus cryptandrus</i>	36
Needlegrass	Needle and Thread	<i>Heterostipa comata</i>	<i>Stipa comata</i>	60
Needlegrass	Green	<i>Nassella viridula</i>	<i>Stipa viridula</i>	59

CURRENT SCIENTIFIC NAME cross reference Table 2

GRASSES

Common Name		Current Scientific Name	Past Scientific Name	Page
Ricegrass	Indian	<i>Achnatherum hymenoides</i>	<i>Oryzopsis hymenoides</i>	62
Wheatgrass	Crested	<i>Agropyron cristatum</i>	<i>Agropyron ristatum</i>	75
Wheatgrass	Siberian	<i>Agropyron fragila</i>	<i>Agropyron sibiricum</i>	79
Bentgrass	Colonial	<i>Agrostis capillaris</i>	<i>Agrostis tenuis</i>	10
Bentgrass	Redtop	<i>Agrostis gigantea</i>	<i>Agrostis alba</i>	12
Bentgrass	Creeping	<i>Agrostis stolonifera</i>	<i>Agrostis alba</i> var. <i>stolonifera</i>	11
Foxtail	Creeping Meadow	<i>Alopecurus arundinaceus</i>	<i>Alopecurus arundinaceus</i>	47
Bluestem	Big	<i>Andropogon gerardii</i>	<i>Andropogon gerardii</i>	24
Bluestem	Sand	<i>Andropogon hallii</i>	<i>Andropogon hallii</i>	27
Bluestem	Caucasian	<i>Bothriochloa bladhii</i>	<i>Andropogon caucasicus</i>	25
Bluestem	Yellow	<i>Bothriochloa ischaemum</i>	<i>Andropogon ischaemum</i>	28
Gramma	Sideoats	<i>Bouteloua curtipendula</i>	<i>Boutelou curtipendula</i>	51
Buffalograss		<i>Bouteloua dactyloides</i>	<i>Buchloe dactyloides</i>	33
Gramma	Black	<i>Bouteloua eriopoda</i>	<i>Boutelou eriopoda</i>	49
Gramma	Blue	<i>Bouteloua gracilis</i>	<i>Boutelou gracilis</i>	50
Brome	Meadow	<i>Bromus biebersteinii</i>	<i>Bromus biebersteinii</i>	30
Brome	Smooth	<i>Bromus inermis</i>	<i>Bromus inermis</i>	32
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Hairgrass	Tufted	<i>Deschampsia cespitosa</i>	<i>Deschampsia cespitosa</i>	52
Saltgrass	Inland	<i>Distichlis stricta</i>	<i>Distichlis stricta</i>	66
Wildrye	Canada	<i>Elymus canadensis</i>	<i>Elymus canadensis</i>	89
Squirreltail	Bottlebrush	<i>Elymus elymoides</i>	<i>Sitanion hystrix</i>	69
Wildrye	Blue	<i>Elymus glaucus</i>	<i>Elymus glaucus</i>	88
Wheatgrass	Hybrid	<i>Elymus hoffmannii</i>	<i>Agropyron repens</i> x <i>A.spicata</i>	76
Wheatgrass	Streambank	<i>Elymus lanceolatus</i>	<i>Agropyron riparium</i>	81
Wheatgrass	Thickspike	<i>Elymus lanceolatus</i>	<i>Agropyron dasystachyum</i>	83
Wheatgrass	Slender	<i>Elymus trachycaulus</i>	<i>Agropyron trachycaulum</i>	80
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Fescue	Rocky Mountain	<i>Festuca saximontana</i>	<i>Festuca ovina</i> var. <i>saximontana</i>	43
Needlegrass	Needle and Thread	<i>Heterostipa comata</i>	<i>Stipa comata</i>	60
Junegrass	Prairie	<i>Koeleria macrantha</i>	<i>Koeleria cristata</i>	54

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Wildrye	Basin	Leymus cinereus	Elymus cinereus	86
Wildrye	Mammoth	Leymus racemosus	Elymus giganteus	90
Wildrye	Beardless	Leymus triticoides	Elymus triticoides	87
Ryegrass	Perennial	Lolium perenne	Lolium perenne	64
Ryegrass	Annual/Italian	Lolium perenne spp.multiflorum	Lolium multiflorum	63
Muhly	Spike	Muhlenbergia wrightii	Muhlenbergia wrightii	58
Needlegrass	Green	Nassella viridula	Stipa viridula	59
Kleingrass		Panicum coloratum	Panicum coloratum	55
Switchgrass		Panicum virgatum	Panicum virgatum	70
Galleta	James'	Paronychia jamesii	Hilaria jamesii	48
Wheatgrass	Western	Pascopyrum smithii	Agropyron smithii	84
Canarygrass	Reed	Phalaris arundinacea	Phalaris arundinacea	34
Timothy	Alpine	Phleum alpinum	Phleum alpinum	72
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Bristlegrass	Plains	Setaria vulpiseta	Setaria macrostachya	29
Indiangrass	Yellow	Sorghastrum nutans	Sorghastrum nutans	53
Cordgrass	Prairie	Spartina pectinata	Spartina pectinata	35
Sacaton	Alkali	Sporobolus airoides	Sporobolus airoides	65
Dropseed	Sand	Sporobolus cryptandrus	Sporobolus cryptandrus	36
Wheatgrass	Intermediate	Thinopyrum intermedium	Agropyron intermedium	77
Wheatgrass	Pubescent	Thinopyrum intermedium	Agropyron trichophorum	78
Wheatgrass	Tall	Thinopyrum ponticum	Agropyron elongatum	82

Establishing Sustainable Grasses on Dryland

Establishing sustainable pasture and rangeland in Colorado's semi-arid climate can bring a number of challenges. The natural limits of low precipitation and low soil organic matter on the eastern plains demands patience and planning from land managers.

There is no blanket formula for establishing a successful stand of native grasses, but there are best practices that will promote the ultimate viability of the planting. While shortcuts do exist, these band-aid solutions can create long-term problems.

Keep in mind that on a dryland operation in eastern Colorado, a healthy stand of grasses takes three to five years to become fully established. For land managers willing to take the time and effort to invest in their property, the pay-off is well worth the wait.

Here are some general guidelines for getting started.

Timing: In an ideal situation, dryland grass seeding will occur between Dec. 1 and May 1. While this planting window will not always be feasible, timing is everything. On dryland, soil should never be laid bare and left vulnerable to wind or water erosion. For projects falling outside of the December-May timeframe, an alternative maintenance plan will need to be formed to ensure the best results for the land.

Planting should occur as soon as possible after a major soil disturbance, such as oil and gas drilling or construction of a roadway.

Control weeds: Before any other work is done, the weeds currently growing on the site must be controlled. Just like with other crops, grasses will not be able to establish in an area where weeds are already creating excessive competition. Plowing, chiseling and disking the soil will kill existing weeds. This will also begin the process of seed bed preparation.

Herbicides may be appropriate for particularly difficult weed growth. Do not assume, however, that herbicides alone will control the weeds. Properly working the soil will still provide great benefit to establishing the new grass seedlings.

Prepare the seed bed: Work the soil with a plow, disc, chisel and/or harrow to achieve the consistency necessary for planting. The soil type and condition will determine how much work needs to be done. Ground that sinks more than an inch under a footstep is too loose. As a measure of adequate tilth, dirt clods should not be larger than an inch in diameter. Proper seed bed preparation will mean greater success later.

Give your grass the upper hand: Plant as soon as possible after the soil has been worked. Waiting will provide an advantage to remaining weed seeds. These seeds will have the first shot at setting down roots in the soil. By planting right away, the seed from the new crop will have less competition and greater opportunity to grow.