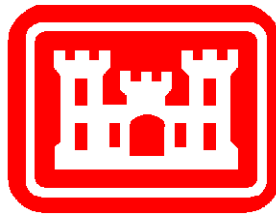


PUBLIC WORKS TECHNICAL BULLETIN 200-1-90
20 APRIL 2011

**GUIDANCE ON NATIVE PLANT SPECIES
SUITABLE FOR ECOLOGICAL RESTORATION**



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20 April 2011

No. 200-1-90

FACILITIES ENGINEERING
ENVIRONMENTAL

GUIDANCE ON NATIVE PLANT SPECIES
SUITABLE FOR ECOLOGICAL RESTORATION

1. Purpose.

a. This Public Works Technical Bulletin (PWTB) provides a list of native plant species suitable for use in the restoration of military lands. The use of native species for restoration and other ecological and land management purposes provides numerous advantages. These advantages can be broadly summarized as supporting and contributing to ecological sustainability. The information provided here can be used by military land managers to fulfill official directives toward and the resulting need for responsible ecological management of lands under their stewardship. Appropriate native plant species can be selected by ecoregion for the lower 48 states.

b. All PWTBs are available electronically (in Adobe® Acrobat® portable document format [PDF]) through the World Wide Web (WWW) at the National Institute of Building Sciences' Whole Building Design Guide web page, which is accessible through URL:

http://www.wbdg.org/ccb/browse_cat.php?o=31&c=215

2. Applicability. This PWTB applies to all U.S. Army facilities in the lower 48 states.

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3. References.

a. Army Regulation (AR) 200-1, "Environmental Protection and Enhancement," 13 December 2007.

b. Executive Order (EO) 13112 "Invasive Species", 3 February 1999.

4. Discussion.

a. AR 200-1, as revised in December 2007, contains policy for environmental protection and enhancement, implementation of pollution prevention, conservation of natural resources, sustainable practices, compliance with environmental laws, and restoration of previously damaged or contaminated sites.

b. EO 13112 requires federal executive agencies to use their authorities to provide for the restoration of native species.

c. In addition to promoting overall ecosystem sustainability, the use and management of native plant species can have positive effects and impacts on: the control of alien species (not native to the ecosystem) and invasive species (likely to cause economic or environmental harm); water resources and wetlands; watershed management; non-point source runoff; soil erosion control; threatened and endangered species; native fauna; maintenance and restoration of vegetation communities; wildland and prescribed fire management; pollution control and contaminant remediation; and training land and range maintenance.

d. The use of native plant species is in concert with and supportive of the US Army Corps of Engineers Strategic Sustainability Performance Plan.

e. Appendix A explains the organization of this PWTB's guidance on plant selection for use on Army training and other lands for the purposes identified in AR 200-1.

f. Appendix B is a list of plants compiled in this study. The table shows each plant's growth form, season of growth, soil types, establishment characteristics, drought tolerance, longevity, cold hardiness, and salinity tolerance. It also shows natural distribution of each species and how suitable they are for erosion control.

g. Appendix C contains references used in Appendix A of this PWTB and a listing of other relevant resources.

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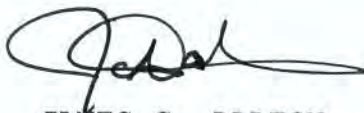
5. Points of Contact (POCs).

a. Headquarters, U.S. Army Corps of Engineers (HQUSACE) is the proponent for this document. The POC at HQUSACE is Mr. Malcolm E. McLeod, CEMP-CEP, 202-761-5696, or e-mail: Malcolm.E.Mcleod@usace.army.mil.

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APPENDIX A:

GUIDANCE ON NATIVE PLANT SPECIES SUITABLE FOR ECOLOGICAL RESTORATION

Data Collection Methods

Data presented in this PWTB is organized by classifying the contiguous United States (lower 48 states) into ecoregions based on a modification of Bailey's classification system (see Brewer 1999 for a discussion of the concept of "ecoregions"). Bailey (1995) described 4 domains, 19 divisions, 34 provinces, and 190 sections of vegetation for the lower 48 states. We collapsed Bailey's 19 divisions into the following ecoregions (Figure A-1):

- Grasslands
 - Temperate Steppe (Central and Northern Great Plains)
 - Tropical/Subtropical (Southern Great Plains, Rio Grande Plains, Coastal Prairies)
 - Prairie (Tallgrass prairie)
- Southwestern U.S.
 - Temperate Desert (Great Basin)
 - Tropical/Subtropical Desert (Chihuahuan, Sonoran deserts)
- Mediterranean
 - California Grasslands
 - California Chaparral
- Western Mountains (Rocky Mountains)
- Northwestern Mountains (Pacific Northwest)
- Humid Temperate Domain: Warm Continental Division
- Humid Temperate Domain: Hot Continental Division
- Humid Temperate Domain: Hot Continental Division (Mountains)
- Humid Temperate Domain: Subtropical Division
- Savannah Division (southern Florida)

For each major division, we surveyed relevant professional, technical, and other literature to document existing resources from which to develop species lists. Additionally, scientific (peer-reviewed) literature and "gray literature" (published technical reports and documents produced by government agencies and non-governmental research groups) were surveyed through the Texas Tech University Libraries and online Internet searches.

Native plant species suitable for ecological restoration purposes were identified for each ecological unit. Several non-native but widely naturalized species also were included.

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Species distribution data were compiled from Stubbendieck et al. 2003, the PLANTS database (<http://plants.usda.gov/>), the Fire Effects Information system (<http://www.fs.fed.us/database/feis>), and Vallentine (1989). These sources also were used to make determinations on the native status of the species included in this report.

Species were further described with respect to specific management considerations (e.g., ease of establishment, longevity, soil adaptation, drought and salinity tolerance, cold-hardiness, and erosion control), based on the primary sources cited in Appendix A as well as additional literature cited in Appendix C. When these sources differed in their characterization of a particular species, personal experience and judgment were used to guide our final determination. Information was organized in tabular format (Appendix B).

Organization of Results

As indicated above, the results of this study are summarized in tabular form in Appendix B. The table is organized by common name; scientific names are included in parentheses under the common names (Table B-1). A detailed explanation of terms used in Appendix B is given at the beginning of that appendix.

As an overall introduction to the results, Table A-1 shows soil texture groups used in this report (column 1) as well as soil texture groups defined by the PLANTS database (column 2) and soil texture classes.

For cold hardiness zones, we used definitions from the U.S. National Arboretum (<http://www.usna.usda.gov/Hardzone/hzm-sm1.html>) as shown in Table A-2. A U.S. cold-hardiness map, with color legend, is shown in Figure A-2.

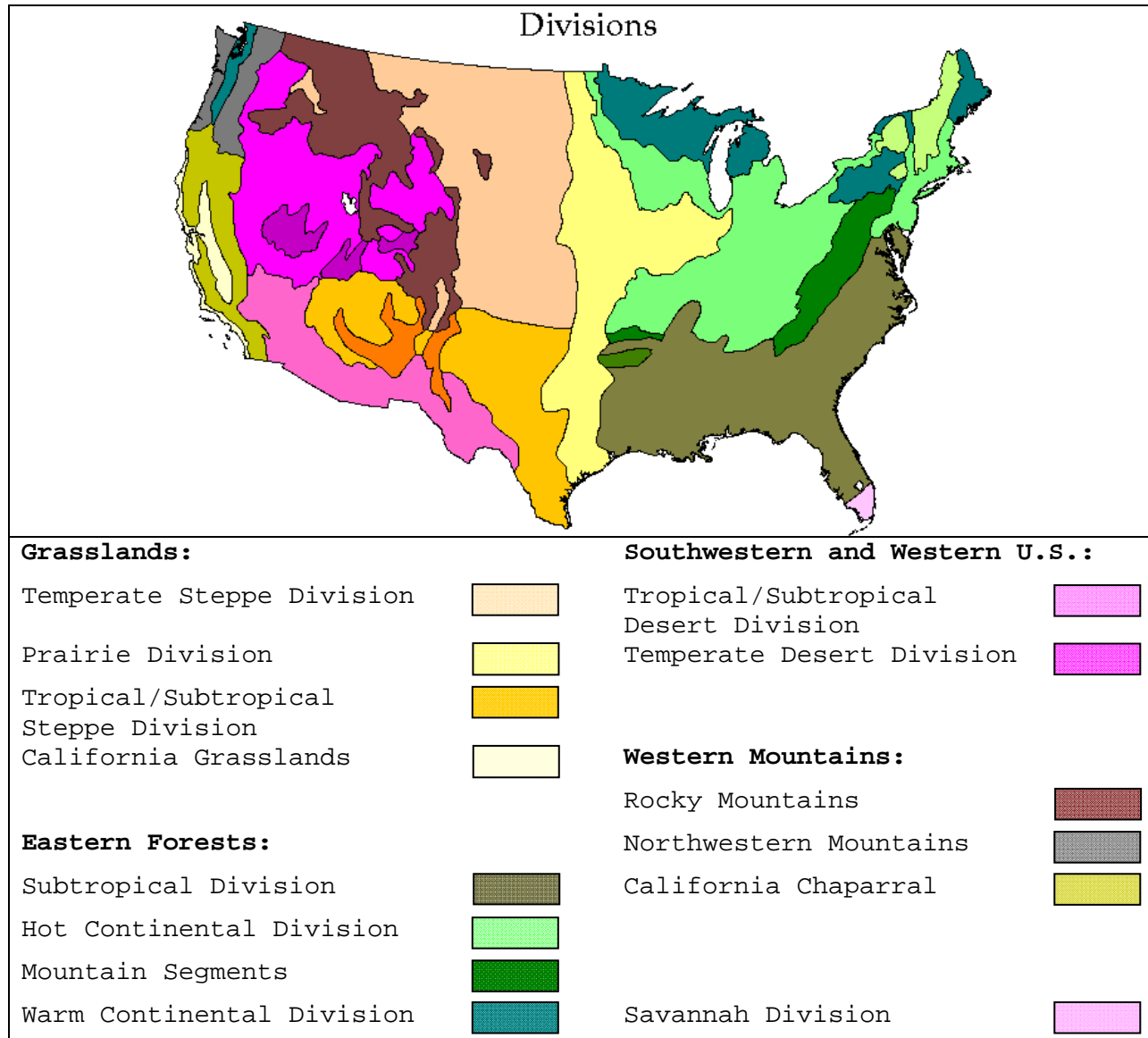


Figure A-1. Map of Bailey's (1995) ecoregions for the contiguous United States (from <http://www.fs.fed.us/land/ecosysgmt/>).

Table A-1. Soil texture groups from the PLANTS database.

Soil texture group (this report)	USDA soil texture group ^{1/}	Soil texture classes		
Sandy	Coarse	Sand	Course sand	Fine sands
		Loamy course sand	Loamy fine sand	Loamy very fine sand
		Very fine sand	Loamy sand	
Silty	Medium	Silt	Sandy clay loam	Very fine sandy loam
		Silty clay loam	Silt loam	Loam
		Fine sandy loam	Sandy loam	Course sandy loam
		Clay loam		
Clayey	Fine	Sandy clay	Silty clay	Clay

^{1/} From <http://plants.usda.gov/charinfo.html>

Table A-2. Cold hardiness definitions according to the U.S. Department of Agriculture (<http://www.usna.usda.gov/Hardzone/hzm-sml.html>). Also, see map in Figure A-2.

Zone	Fahrenheit	Celsius	Example Cities
1	Below -50	Below -45.6	Fairbanks, AK; Resolute, NT (Canada)
2a	-50 to -45	-42.8 to -45.5	Prudhoe Bay, AK; Flin Flon, MB (Canada)
2b	-45 to -40	-40.0 to -42.7	Unalakleet, AK; Pinecreek, MN
3a	-40 to -35	-37.3 to -39.9	International Falls, MN; St. Michael, AK
3b	-35 to -30	-34.5 to -37.2	Tomahawk, WI; Sidney, MT
4a	-30 to -25	-31.7 to -34.4	Minneapolis/St. Paul, MN; Lewistown, MT
4b	-25 to -20	-28.9 to -31.6	Northwood, IA; Nebraska
5a	-20 to -15	-26.2 to -28.8	Des Moines, IA; Illinois
5b	-15 to -10	-23.4 to -26.1	Columbia, MO; Mansfield, PA
6a	-10 to -5	-20.6 to -23.3	St. Louis, MO; Lebanon, PA
6b	-5 to 0	-17.8 to -20.5	McMinnville, TN; Branson, MO
7a	0 to 5	-15.0 to -17.7	Oklahoma City, OK; South Boston, VA
7b	5 to 10	-12.3 to -14.9	Little Rock, AR; Griffin, GA
8a	10 to 15	-9.5 to -12.2	Tifton, GA; Dallas, TX
8b	15 to 20	-6.7 to -9.4	Austin, TX; Gainesville, FL
9a	20 to 25	-3.9 to -6.6	Houston, TX; St. Augustine, FL
9b	25 to 30	-1.2 to -3.8	Brownsville, TX; Fort Pierce, FL
10a	30 to 35	1.6 to -1.1	Naples, FL; Victorville, CA
10b	35 to 40	4.4 to 1.7	Miami, FL; Coral Gables, FL
11	Above 40	Above 4.5	Honolulu, HI; Mazatlan, Mexico

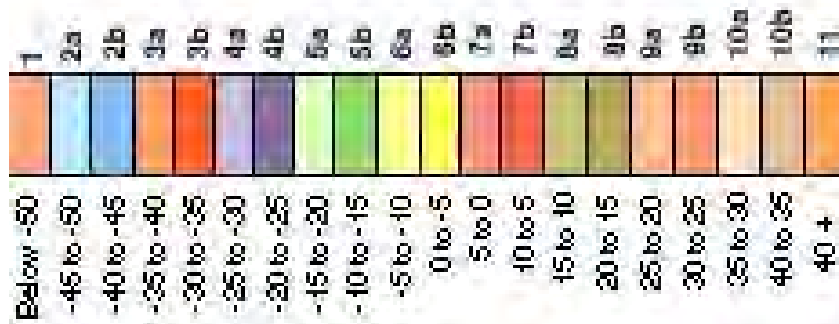


Figure A-2. USDA Plant Hardiness Zone map (from <http://www.usna.usda.gov/Hardzone/ushzmap.html>).

APPENDIX B

PLANT SPECIES SUITABLE FOR ECOLOGICAL RESTORATION ON U.S. ARMY LANDS

Beginning on the following page, Table B-1 summarizes the results of our data study of plant species suitable for ecological restoration on U.S. Army installations. The table is organized alphabetically, by the grass common name, with each scientific name beneath (in parentheses).

Column headings for Table B-1 are described below.

Growth form:

- G: Graminoid (member of Poaceae or Cyperaceae families)
- F: Forb (herbaceous dicot species)
- S: Shrub (woody dicot species; generally branched near the ground surface)
- T: Tree

Season of growth:

- W: Warm season
- C: Cool season
- E: Evergreen

Soil:

Stubbendieck et al. (2003) used soil categories of "Sandy," "Silty," and "Clayey" without explicit definition. Adaptation codes of "Good," "Fair," and "Poor" were similarly undefined (ibid.). In this report, the same category labels are used with subjective ratings based on subject matter experience given below.

- 1: Good: well adapted to the texture indicated
- 2: Fair: moderately adapted to the texture indicated
- 3: Poor: poorly adapted to the texture indicated

Ease of establishment:

This column is a synthesis of establishment characteristics including seed viability and germination, and seedling vigor. Stubbendieck (ibid.) used ratings of "1: Good, 2: Fair, and 3: Poor" without explicit definitions.

Longevity:

This column relates to longevity of stand survival. Stubbendieck (ibid.) used ratings of "1: Good, 2: Fair, and 3: Poor" without explicit definitions.

Drought tolerance:

Stubbendieck (ibid.) used ratings of "1: Good, 2: Fair, and 3: Poor" without explicit definitions. The PLANTS database defined drought tolerance as: "What is the relative tolerance of the plant to drought conditions compared to other species with the same growth habit from the same geographical region?"

Drought tolerance is defined here with the following example. Imagine that in an acre of land there are low areas that have heavy soil that tends to accumulate more soil moisture, and higher areas with coarse-textured soil that tends to accumulate less soil moisture. Some plant species are most frequently found growing in the higher areas with the coarse soil texture. These plant species are considered to be more drought tolerant than the species that are frequently found in the low areas with fine textured soil.

Cold hardiness:

Stubbendieck (ibid.) rated cold-hardiness on a scale of "1: Good, 2: Fair, and 3: Poor" without explicit definitions of these categories. The PLANTS database lists a "Minimum temperature that is defined as 'The minimum tolerable temperature is the lowest temperature recorded in the plant's historical range. If this is not available, the record low January temperature recorded at climate stations within the current geographical range of the plant is used. This definition does not apply to summer annuals'."

Salinity tolerance:

Stubbendieck (ibid.) rates salinity tolerance on a scale of "1: Good, 2: Fair, and 3: Poor" without explicit definitions of these categories. The PLANTS database defines salinity tolerance as follows: "Tolerance to a soil salinity level is defined as only a slight reduction (not greater than 10%) in plant growth. None = tolerant to a soil with an electrical conductivity of the soil solution extract of 0-2 dS/m; Low = tolerant to 2.1-4.0 dS/m; Medium = tolerant to 4.1-8.0 dS/m; High = tolerant to greater than 8.0 dS/m."

Erosion control:

Erosion control is rated as "1: Good, 2: Fair, and 3: Poor."
This is based on depth and horizontal extent of the root system
and ability of the species to bind to soil.

Region:

Information listed under the heading of "Region" relates to
geographic distribution of each species. Primary sources
consulted for this information included Stubbendieck et al.
(2003), Vallentine (1989), and the distributional maps provided
in the PLANTS database.

Table B-1. Summary of results of data study, organized by common name.

Common and scientific name	Growth		Soil			Plant characteristics							Region										Comments				
	Growth form	Season of growth	Sandy	Silty	Clayey	Ease of establishment	Longevity	Drought tolerance	Cold hardiness	Salinity tolerance	Erosion control	Temperate Steppe	Tropical/Subtropical	Prairie	Temperate Desert	Tropical/subtropical desert	California Grasslands	Humid Temperate: Subtropical	Humid Temperate: Hot continental	Humid Temperate: Mountain segment	Humid Temperate: Warm continental	Western mountains: Rocky Mountains		Western mountains: Northwestern Mtns	Western Mountains: California chaparral	Southern Florida: Savanna	
Alfalfa (<i>Medicago sativa</i>)	F	W	1	1	2	1	1	2	2	2	1	•	•	•	•	•											Most widely planted legume; over 400 varieties available; an introduced species but widely naturalized
Arizona cottontop (<i>Digitaria californica</i>)	F	W	1	1	2	2	1	1	2	2	1		•		•												Variety "Loetta" suitable for southwestern US
Arrowleaf balsamroot (<i>Balsamorhiza sagittata</i>)	F	C	2	1	1	2	1	1	1	3	1	•		•		•											
Bitterbrush (<i>Purshia tridentata</i>)	S	E	1	2	3	2	1	1	1	2	1	•		•	•							•	•	•			Varieties "Lassen," "Fountain Green," and "Maybell"
Black cherry (<i>Prunus serotina</i>)	T	W	1	2	2	1	2	2	1	2	1			•	•		•	•	•	•							

KEY: G=Graminoid; F=Forb; S=Shrub; T=Tree; W=Warm season; C=Cool season; E=Evergreen;
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Common and scientific name	Growth		Soil			Plant characteristics						Region								Comments							
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Blackeyed Susan (<i>Rudbeckia hirta</i>)	F	W	2	1	1	1	1	2	1	3	1	•	•	•			•	•	•	•	•	•	•	•	•	•	Biennial species but long-lived populations; variety “Golden Jubilee” adapted to the northeast U.S.
Bluegrass, big (<i>Poa ampla</i>)	G	C	1	1	2	2	1	1	1	3	1	•			•	•	•						•	•		Varieties “Sherman” (OR). “Service” (Canada); “Canbar” (WA)	
Bluegrass, mutton (<i>Poa fendleriana</i>)	G	C	1	1	2	1	1	1	1	3	1				•	•						•		•			

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Bluestem, big (<i>Andropogon gerardii</i> var. <i>gerardii</i>)	G	W	2	1	1	2	1	2	1	2	1	•	•	•				•	•	•	•					Best adapted to sandy or clay loams; Varieties “Bison,” “Bonilla,” and “NDG-4” suitable in northern Great Plains; “Champ,” “Kaw,” “Pawnee” and “Rountree” suitable for central Great Plains.
Bluestem, broomsedge (<i>Andropogon virginicus</i>)	G	W	2	1	1	1	1	1	2	3	1			•					•	•	•				•	
Bluestem bushy (<i>Andropogon glomeratus</i>)	G	W	2	1	2	1	1	3	1	3	1		•			•		•	•	•					•	

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Bluestem, little (<i>Schizachyrium scoparium</i>)	G	W	1	1	1	2	1	1	1	3	1	•	•	•	•	•	•	•	•	•	•	•	•	•	•	Varieties “Aldous,” “Camper,” “Cimmaron,” “Pastura” and “Blaze” suitable for central Great Plains.
Bluestem, sand (<i>Andropogon gerardii</i> var. <i>paucipilus</i> ; <i>A. hallii</i>)	G	W	1	2	3	2	1	2	1	3	1	•	•	•	•	•	•	•	•	•	•	•	•	•	•	Varieties “Elida,” “Goldstrike,” and “Garden” suitable for northern to southern Great Plains; variety “Woodward” suitable for southern Great Plains.
Boneset, common (<i>Eupatorium perfoliatum</i>)	F	W	1	1	1	1	1	2	1	1	1	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
Brome, meadow (<i>Bromus biebersteinii</i>)	G	C	1	1	1	2	1	2	1	3	1	•	•	•	•	•	•	•	•	•	•	•	•	•	•	“Regar” – not native

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Brome, mountain (<i>Bromus marginatus</i>)	G	C	1	2	3	1	2	2	1	1	1				•		•									Varieties "Bromar" and "Garnet"
Button erylgo (<i>Eryngium yuccifolium</i>)	F	W	1	1	2	1	1	1	1	3	1			•			•	•	•	•						
California oatgrass (<i>Danthonia californica</i>)	G	C	3	1	1	2	1	2	3	3	1				•		•					•		•		
Canadian milkvetch (<i>Astragalus canadensis</i>)	F		2	1	2		2	2	1	3	1	•		•	•			•	•	•	•	•				Variety "Sunrise" from South Dakota
Catalpa (<i>Catalpa speciosa</i>)	T	W	1	1	2	1	2	2	1	3	1										•					
Columbine, red (<i>Aquilegia canadensis</i>)	F	W	1	2	2	1	1	1	1	1	1			•					•	•	•					Varieties "Canyon Vista," "Corbett" and "Nana."
Dropseed, prairie (<i>Sporobolus asper</i>)	G	W	1	1	2	1	1	1	1	3	1			•							•					

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Dropseed, sand (<i>Sporobolus cryptandrus</i>)	G	W	1	1	2	2	2	1	1	2	1	•	•	•	•	•					•					Borden County Germplasm released from stock in Texas.
Eastern cottonwood (<i>Populus deltoides</i>)	T	W	3	1	3	1	2	2	1	2	1	•		•				•	•	•	•					Variety "Siouxland"
Eastern red cedar (<i>Juniperus virginiana</i>)	T	E	1	1	2	2	1	1	1	3	1	•						•	•	•	•				•	Varieties "Canaert" and "Taylor"
Fescue, Arizona (<i>Festuca arizonica</i>)	G	C	2	2	1	1	1	2	1	3	1					•						•				
Fescue, Idaho (<i>Festuca idahoensis</i>)	G	C	1	1	1	3	1	3	1	3	1				•		•					•	•			Varieties "Joseph" and "Nezpurs" have higher seed viability than native species.
Flax, blue (<i>Linum lewisii</i>)	F	C	1	1	2	1	3	2	1	3	1	•	•		•	•										Variety "Appar"

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Fourwing saltbush (<i>Atriplex canescens</i>)	S	E	1	1	1	1	1	1	1	1	2	•	•		•	•						•				Widely distributed, tolerant of a variety of soil conditions; very palatable; strong erosion control. Cultivars include “Marana” (from California), “Rincon” (from New Mexico), “Santa Rita” (from Arizona) and “Wytana” (suitable for northern Great Plains and mountain foothills of Idaho, Montana and Wyoming.

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Galleta (<i>Hilaria jamesii</i>)	G	W	2	1	1	3	1	1	1	2	1			•		•											Variety "Viva" has higher germination and is easier to establish than native populations
Globemallow, scarlet (<i>Sphaeralcea coccinea</i>)	F	W	1	2	3	2	1	1	1	2	3	•	•		•	•											
Goldenrod, gray (<i>Solidago nemoralis</i>)	F	W	1	1	3	1	1	2	1	3	1	•		•			•	•	•	•							
Golden Alexander (<i>Zizia aurea</i>)	F	W	2	1	2	1	1	1		1				•			•	•	•	•							

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1=Good; 2=Fair; 3=Poor

Common and scientific name	Growth		Soil			Plant characteristics										Region										Comments	
	Growth form	Season of growth	Sandy	Silty	Clayey	Ease of establishment	Longevity	Drought tolerance	Cold hardiness	Salinity tolerance	Erosion control	Temperate Steppe	Tropical/Subtropical	Prairie	Temperate Desert	Tropical/subtropical desert	California Grasslands	Humid Temperate: Subtropical	Humid Temperate: Hot continental	Humid Temperate: Mountain segment	Humid Temperate: Warm continental	Western mountains: Rocky Mountains	Western mountains: Northwestern Mtns	Western Mountains: California chaparral	Southern Florida: Savanna		
Grama, blue (<i>Bouteloua gracilis</i>)	G	W	2	1	2	2	1	1	1	2	1	•	•		•	•											Variety "Lovington" widely adapted; variety "Hachita" is drought tolerant; variety "Alma" adapted for southern and Central Great Plains; "Bad River" ecotype suitable for the northern Great Plains

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	Growth form	Season of growth	Sandy	Silty	Clayey	Ease of establishment	Longevity	Drought tolerance	Cold hardiness	Salinity tolerance	Erosion control	Temperate Steppe	Tropical/Subtropical	Prairie	Temperate Desert	Tropical/subtropical desert	California Grasslands	Humid Temperate: Subtropical	Humid Temperate: Hot continental		Humid Temperate: Mountain segment	Humid Temperate: Warm continental	Western mountains: Rocky Mountains	Western mountains: Northwestern Mtns	Western Mountains: California chaparral	Southern Florida: Savanna
Gramma, sideouta (<i>Bouteloua curtipendula</i>)	G	W	1	1	1	1	1	2	1	3	1	•	•	•	•	•										Drought tolerant (including seedlings). Numerous varieties available: “Vaughn” and “Niner” for southwest US; “Trailway” from tallgrass prairie; “Pierre” and “Kildeer” for northern Great Plains; “Haskell” and “El Reno” for southern Great Plains
Gray’s sedge (<i>Carex grayi</i>)	G	W	2	1	1	1	1	3	3	2	1									•	•					
Green sprangletop (<i>Leptochloa dubia</i>)	G	W	2	1	2	1	3	1	2	3	1		•			•									•	Variety “Van Horn” from Texas
Illinois bundleflower (<i>Desmanthus illinoisensis</i>)	F	W	1	1	1	1	1	2	1	3	1	•	•	•	•		•	•								Variety “Sabine” suitable for Texas

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Common and scientific name	Growth		Soil			Plant characteristics						Region										Comments				
	Growth form	Season of growth	Sandy	Silty	Clayey	Ease of establishment	Longevity	Drought tolerance	Cold hardiness	Salinity tolerance	Erosion control	Temperate Steppe	Tropical/Subtropical	Prairie	Temperate Desert	Tropical/subtropical desert	California Grasslands	Humid Temperate: Subtropical	Humid Temperate: Hot continental	Humid Temperate: Mountain segment	Humid Temperate: Warm continental		Western mountains: Rocky Mountains	Western mountains: Northwestern Mtns	Western Mountains: California chaparral	Southern Florida: Savanna
Honey locust (<i>Gleditsia triacanthos</i>)	T	W	3	1	1	1	1	1	1	3	1							•	•	•						
Huckleberry, grouse (<i>Vaccinium scoparium</i>)	S	?	1	1	2	1	1	2	2	3	1	•										•	•			
Indiangrass (<i>Sorghastrum nutans</i>)	G	W	1	1	1	2	1	2	1	2	1	•	•	•	•			•	•	•	•					Varieties "Holt" (NE), "Llano" (NM), "Lometa" (TX), "Osage" (KS/OK), "Oto" (NE/KS) and "Tomahawk" (ND/SD)
Indiangrass, lopsided (<i>Sorghastrum secundum</i>)	G	W	1	2	3	2	2	2	1	2	1							•							•	
Indian ricegrass (<i>Stipa hymenoides</i>)	G	C	1	1	2	2	1	1	1	2	1	•		•	•	•										Varieties "Nezpar," "Paloma" and "Rimrok"
Leadplant (<i>Amorpha canescens</i>)	S	W	1	1	2	1	1	1	1	3	1									•						

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Common and scientific name	Growth		Soil			Plant characteristics						Region										Comments					
	Growth form	Season of growth	Sandy	Silty	Clayey	Ease of establishment	Longevity	Drought tolerance	Cold hardiness	Salinity tolerance	Erosion control	Temperate Steppe	Tropical/Subtropical	Prairie	Temperate Desert	Tropical/subtropical desert	California Grasslands	Humid Temperate: Subtropical	Humid Temperate: Hot continental	Humid Temperate: Mountain segment	Humid Temperate: Warm continental		Western mountains: Rocky Mountains	Western mountains: Northwestern Mtns	Western Mountains: California chaparral	Southern Florida: Savanna	
Lovegrass, sand (<i>Eragrostis trichodes</i>)	G	W	1	2	3	1	2	1	2	3	1	•	•														“Nebraska 27” (NE), “Mason” (TX), “Bend” (KS and OK)
Mexican cliffrose (<i>Purshia stansburiana</i>)	S	E	2	1	1	3	1	1	1	1	2				•	•											
Milkweek, butterfly (<i>Asclepias tuberosa</i>)	F	W	1	1	3	1	2	1	1	3	1			•	•			•	•	•	•					•	
Mountain mahogany, curleaf (<i>Cercocarpus ledifolius</i>)	S	E	1	1	3	3	1	1	1	3	1	•			•												
Mountain mahogany, true (<i>Cercocarpus montanus</i>)	S		1	1	3	2	1	2	1	2					•	•						•				•	Varieties “Green Stipagrass,” and “Lodorm”
Muhly, hairawn (<i>Muhlenbergia capillaris</i>)	G	W	1	1	1	2	1	3	2	1	1															•	
Pine, pinyon (<i>Pinus edulis</i>)	T	E	1	1	1	2	1	1	1	2	1				•	•						•					

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Pine, ponderosa (<i>Pinus ponderosa</i>)	T	E	1	1	3	1	1	1	1	2	1				•	•						•	•	•	
Prairie blazing star (<i>Liatris pycnostachya</i>)	F	W	1	1	1	1	1	2	1	3	1			•											Variety "Eureka"
Needle and thread (<i>Hesperostipa comata</i>)	G	C	1	1	2	1	1	1	1	1	1	•			•	•	•								
Needlegrass, Columbia (<i>Achnatherum nelsonii</i>)	G	C	2	1	1	2	1	1	1	2	1	•			•										
Needlegrass, foothill (<i>Nassella lepida</i>)	G	C	1	2	3	1	1	2	2	3	1						•								
Needlegrass, green (<i>Nassella viridula</i>)	G	C	3	1	1	2	2	1	1	2	1	•			•							•			
Needlegrass, nodding (<i>Nassella cernua</i>)	G	C	2	1	1	1	1	1	2	3	1						•						•		
Needlegrass, purple (<i>Nassella pulchra</i>)	G	C	1	1	1	1	1	1	2	3	1						•						•		

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Needlegrass, Thurber's (<i>Achnatherum thurberianum</i>)	G	C	1	1	2	2	1	1	1	3	1				•						•			•		
New Jersey tea (<i>Ceanothus americanus</i>)	S	W	1	1	2	2	1	1	1	3	1			•				•	•	•	•					
Ohio buckeye (<i>Aesculus glabra</i>)	T	W	3	1	1	1	2	2	1	3	1								•	•	•					
Paper birch (<i>Betula papyrifera</i>)	T	W	1	1	1	1	2	3	1	2	1										•					
Penstemon, Firecracker (<i>Penstemon eatonii</i>)	F	C	1	1	1	2	3	2	1	3	1				•											Has complicated germination patterns relative to chilling requirements
Penstemon, Palmer (<i>Penstemon palmeri</i>)	F		1	1	3	1	3	1	1	3	1				•											

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Penstemon, Rocky Mountain (<i>Penstemon strictus</i>)	F		1	2	3	1		2	1	3	1				•												Variety "Bandera" suited for clayey soils
Prairie junegrass (<i>Koeleria macrantha</i>)	G	C	1	2	2	1	1	1	1	3	1	•	•	•	•	•	•				•	•	•	•			
Prairie willow (<i>Salix humilis</i>)	S		1	2	3	2	1	3	1	3	1			•					•	•	•						
Red fescue (<i>Festuca rubra</i>)	G	C	3	1	1	1	1	2	1	3	1	•			•	•	•				•	•	•	•			
Rose, wild (<i>Rosa woodsii</i>)	S	C	1	1	2	1	1	2	1	3	1	•			•	•						•			•		
Russet buffaloberry (<i>Shepherdia canadensis</i>)	S	C	1	1	2	3	1	1	1	2	1	•	•														
Sacaton, alkali (<i>Sporobolus airoides</i>)	G	W	1	1	1	2	1	2	1	1	1	•	•		•	•	•										Suitable for alkaline or saline soils
Sagebrush, big (<i>Artemisia tridentata</i>)	S	E	3	1		2	1	1	1	2	1	•			•	•						•			•		Variety "Hobblecreek"

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Sage, fringed (<i>Artemisia frigida</i>)	S	C	1	1	1	2	1	1	1	2	1	•	•		•	•											
Sandreed, prairie (<i>Calamovilfa longifolia</i>)	G	W	1	2	3	2	1	1	1	3	1	•	•	•													Variety "Goshen"
Seashore bentgrass (<i>Agrostis pallens</i>)	G	C	3	1	1	2	1	3	1	3	1				•		•						•				
Serviceberry (<i>Amelanchier alnifolia</i>)	S		1	1	1	2	1	3	1	3	1				•		•					•	•	•			
Serviceberry, Utah (<i>Amelanchier utahensis</i>)	S	C	1	1	1	1	1	1	1	3	1				•	•						•		•			
Shadscale (<i>Atriplex confertifolia</i>)	S		1	1	1	3	2	1	1	1	1	•			•												Difficult to germinate seeds; establishment potential increased if planted from container stock or cuttings.

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	Growth form	Season of growth	Sandy	Silty	Clayey	Ease of establishment	Longevity	Drought tolerance	Cold hardiness	Salinity tolerance	Erosion control	Temperate Steppe	Tropical/Subtropical	Prairie	Temperate Desert	Tropical/subtropical desert	California Grasslands	Humid Temperate: Subtropical	Humid Temperate: Hot continental	Humid Temperate: Mountain segment	Humid Temperate: Warm continental	Western mountains: Rocky Mountains		Western mountains: Northwestern Mtns	Western Mountains: California chaparral	Southern Florida: Savanna	
Squirreltail (<i>Elymus elymoides</i>)	G	C	2	1	1	2	2	1	1	1	2	•	•		•												“Sand Hollow” and “Fish Creek” germplasm (ID); “Toe Jam Creek” germplasm (NV); “Pueblo” and “Wapiti” germplasms, (CO)
Subalpine fir (<i>Abies lasiocarpa</i>)	T	E	1	1	3	1	1	3	1	3	2											•	•				
Sugar maple (<i>Acer saccharum</i>)	T	W	1	1	3	1	1	2	1	3	2									•	•						
Sugarberry (<i>Celtis laevigata</i>)	T	W	3	1	1	1	2	3	2	3	1	•			•		•	•							•		

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Switchgrass (<i>Panicum virgatum</i>)	G	W	1	1	1	2	1	2	1	2	1	•	•	•				•	•	•	•				•	Many varieties available (e.g., “Alamo” (TX), “Blackwell” (OK), “Dacotah” (ND), “Forestburg” (SD), “Kanlow” (OK), “Nebraska 28” (NE), “Grenville” (NM))
Sycamore (<i>Platanus occidentalis</i>)	T	W	1	1	2	1	1	3	1	3	1							•	•	•	•					
Tall tickseed (<i>Coreopsis tripteris</i>)	F	W	1	1	2	1	1	1	1	1	1							•	•	•	•					
Tufted hairgrass (<i>Deschampsia caespitosa</i>)	G	C	1	1	1	2	1	3	1	3	1			•		•					•	•	•	•		
Tulip poplar (<i>Liriodendron tulipifera</i>)	T	W	1	1	2	1	1	3	2	3	1							•	•	•	•					

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Vine mesquite (<i>Panicum obtusum</i>)	G	W	2	1	1	2	1	2	2	2	1	•			•											Best adapted to soils that are silty or clayey; often found in moist bottomland sites
Wheatgrass, bluebunch (<i>Elymus spicatus</i>)	G	C	2	1	1	2	2	1	1	2	1	•		•		•					•					Varieties “Goldar” and “Whitmar” (WA) “Secar” (ID) and “Anatone”
Wheatgrass, slender (<i>Elymus trachycaulus</i>)	G	C	2	1	1	1	2	1	1	1	1	•		•	•	•				•	•					Varieties “Primar,” “Pryor” (MT) “Revenue” (Canada) and “San Luis”
Wheatgrass, thickspike (<i>Elymus lanceolatus</i>)	G	C	1	1	1	2	2	1	2	2	1	•		•												Vareity “Sodar”

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Wheatgrass, western (<i>Elymus smithii</i>)	G	W	3	1	1	2	1	2	1	1	1	•	•	•	•	•					•					Tolerant of alkaline conditions. Many varieties available: e.g., “Ariba” (southwestern U.S. and western central Great Plains); “Flintlock” (central Great Plains); “Rosana” and “Rodan” (northern Great Plains)
Wildrye, basin (<i>Leymus cinereus</i>)	G	C	1	1	1	2	1	2	1	1	1			•												Varieties “Magnar” (WA) and “Trailhead” (MT)
Wildrye, beardless (<i>Leymus triticoides</i>)	G	C	3	1	1	3	1	1	1	1	1			•	•	•							•			Variety “Shoshone”

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	Growth form	Season of growth	Sandy	Silty	Clayey	Ease of establishment	Longevity	Drought tolerance	Cold hardiness	Salinity tolerance	Erosion control	Temperate Steppe	Tropical/Subtropical	Prairie	Temperate Desert	Tropical/subtropical desert	California Grasslands	Humid Temperate: Subtropical	Humid Temperate: Hot continental	Humid Temperate: Mountain segment	Humid Temperate: Warm continental	Western mountains: Rocky Mountains		Western mountains: Northwestern Mtns	Western Mountains: California chaparral	Southern Florida: Savanna
Wildrye, blue (<i>Elymus glaucus</i>)	G	C	1	1	1	1	1	1	1	2	1				•	•	•					•	•			Varieties “Mariposa” (CA), “Arlington” and “Union Flat” (WA) and “Elkton” (OR)
Wildrye, Canada (<i>Elymus canadensis</i>)	G	C	1	1	1	1	3	2	1	2	1	•		•	•						•					From S and lit
Winterfat (<i>Ceratoides lanata</i>)	S	E	1	1	1	2	1	1	1	1	1	•			•	•										Variety “Hatch”
White fir (<i>Abies concolor</i>)	T	E	1	1	3	1	1	2	1	3	1				•							•				
Yarrow, white (<i>Achillea millefolium</i>)	F	C	2	1	3	1	2	1	1	1	1	•			•	•	•		•	•	•	•	•	•		

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APPENDIX C:

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