

Native Plant Species Suitable for Ecological Restoration

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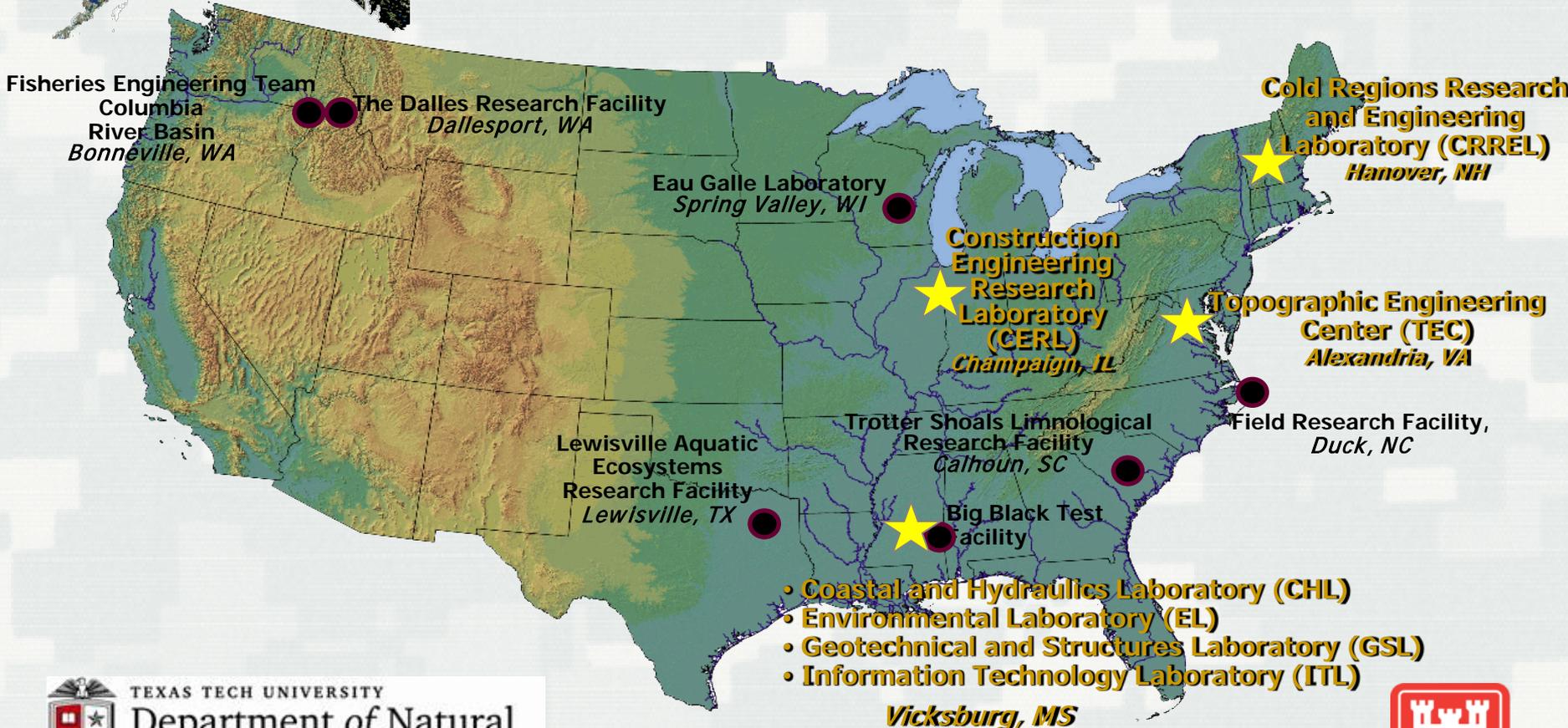
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Engineer Research and Development Center



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Background

- DoD manages approximately 25 million acres in US
- Large training mission component
- Variety of ecosystems



Military Range Landscape



Western Ragweed



Cheatgrass and Crested Wheatgrass



Terminology

- Restoration - *The process of repairing man caused damage to the diversity and dynamics of indigenous ecosystems*
- Revegetation - *Reestablishment of vegetation*
- Reclamation - *Returning the community to the conditions are comparable to that prior to disturbance*
- Rehabilitation - *A partial movement along the trajectory from degraded to the original state*
- Remediation, mitigation - *Activities that lessen the degree of damage*

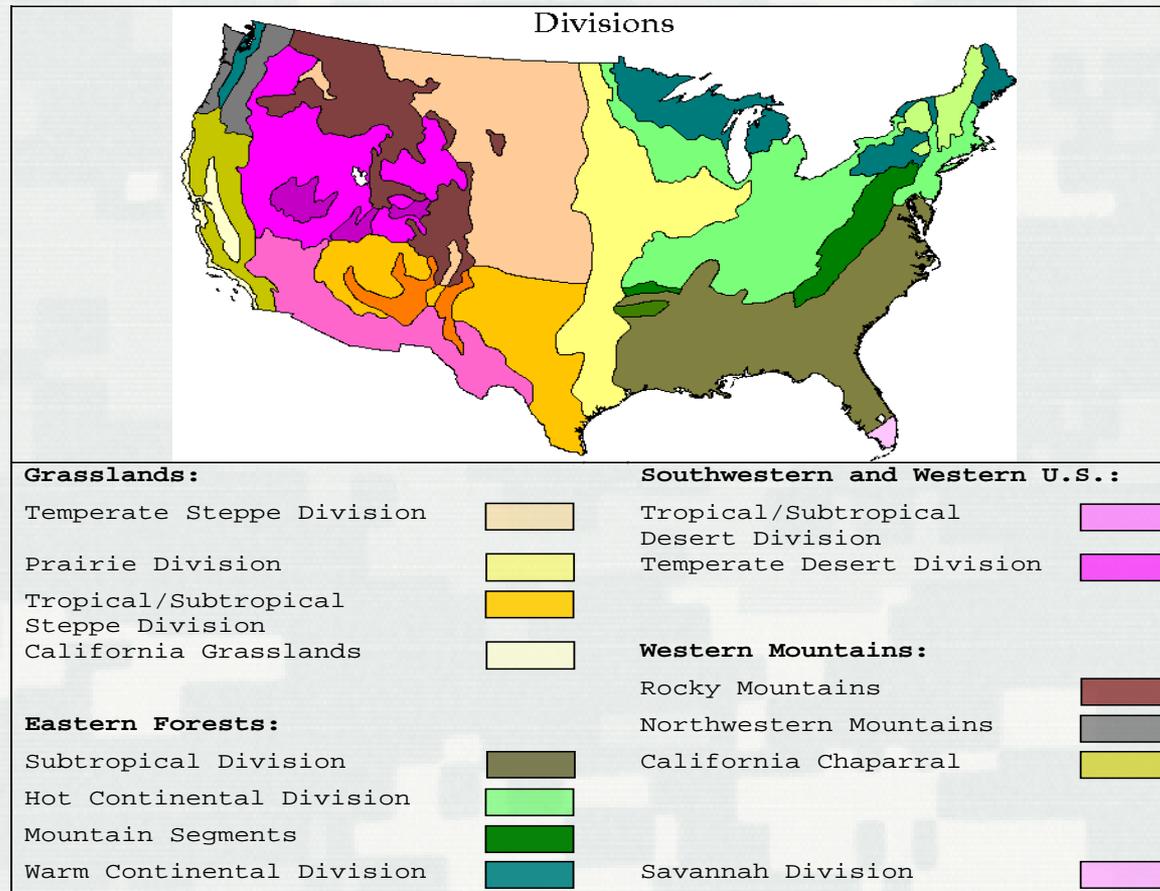
Ecoregions

Collapsed Bailey's 19 divisions into the following ecoregions

- 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)

Ecoregions

(Modified from Bailey (1995) –Ecoregions of the United States)



Approach

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

Approach

- 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).
- Species were further described with respect to specific management considerations
 - ▶ growth form
 - ▶ season of growth
 - ▶ ease of establishment,
 - ▶ longevity,
 - ▶ soil adaptation,
 - ▶ drought and salinity tolerance,
 - ▶ cold-hardiness, and
 - ▶ erosion control

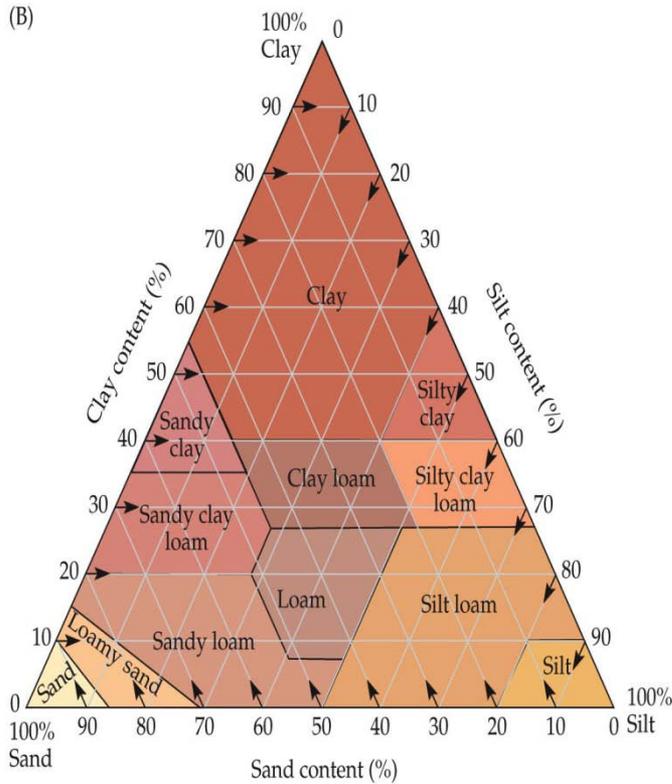
Approach

- Growth form -- graminoid, forb, shrub, tree
- Season of growth -- warm season, cool season, evergreen
- Ease of establishment -- synthesis of characteristics – e.g., seed viability, germination, seedling vigor
- Longevity -- stand survival
- Drought tolerance -- relative value judgment
- Salinity tolerance -- < 10% reduction in plant growth
- Cold hardiness -- minimal tolerable temperature = lowest temperature recorded in historical range

Approach

Soil adaptation

Erosion control

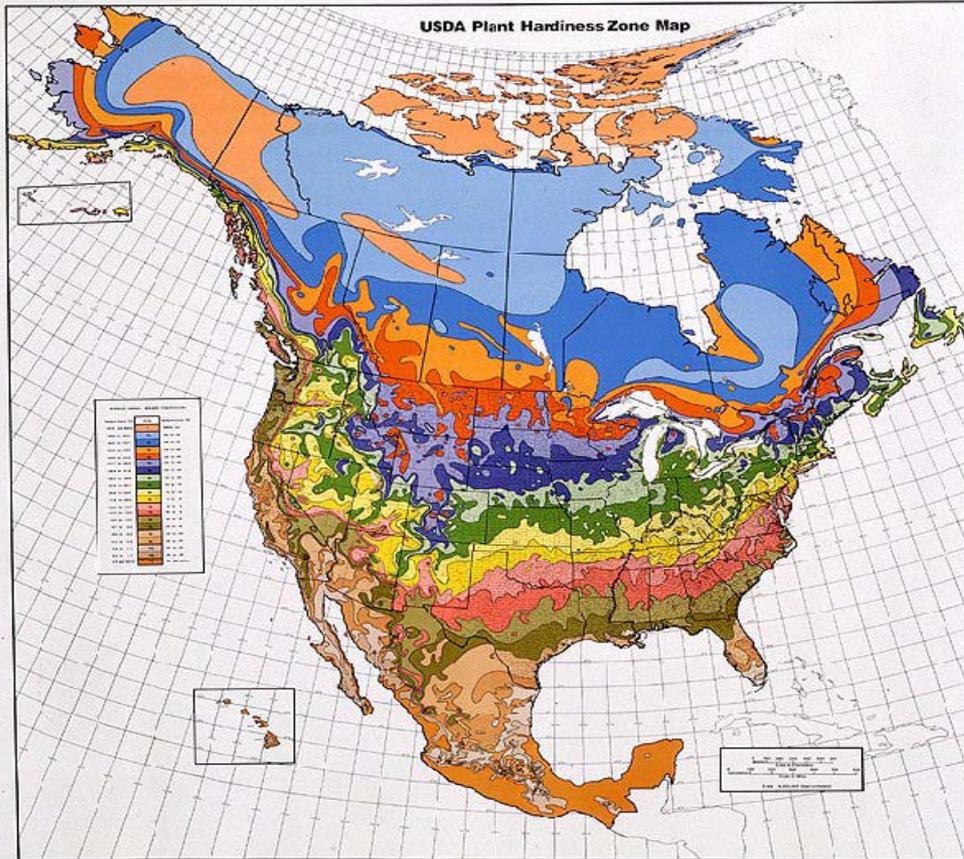


ECOLOGY OF PLANTS, Second Edition, Figure 4.1 (Part 2) © 2006 Sinauer Associates, Inc.



Approach

Cold hardiness



1	2a	2b	3a	3b	4a	4b	5a	5b	6a	6b	7a	7b	8a	8b	9a	9b	10a	10b	11
Below -50	-45 to -50	-40 to -45	-35 to -40	-30 to -35	-25 to -30	-20 to -25	-15 to -20	-10 to -15	-5 to -10	0 to -5	5 to 0	10 to 5	15 to 10	20 to 15	25 to 20	30 to 25	35 to 30	40 to 35	40 +

Results

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 hardness	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			•	•	•	•	•	•								

Results

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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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Bluestems



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Results

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 hardness	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	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									•								

Results

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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					•																



Needle and Thread



Results

Common and scientific name	Growth		Soil			Plant characteristics				Region										Comments						
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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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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							•	•	•	•						

Other Resources

- Bailey, R.G. 1995. Ecoregions. U.S. Forest Service. <http://www.fs.fed.us/land/ecosystem/>
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- Valentine, J.F. 1989. Range development and improvements. 3rd ed. Academic Press, New York, NY.



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Questions?

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