Ecological site R058DY015SD
Thin Claypan

Accessed: 05/19/2024

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

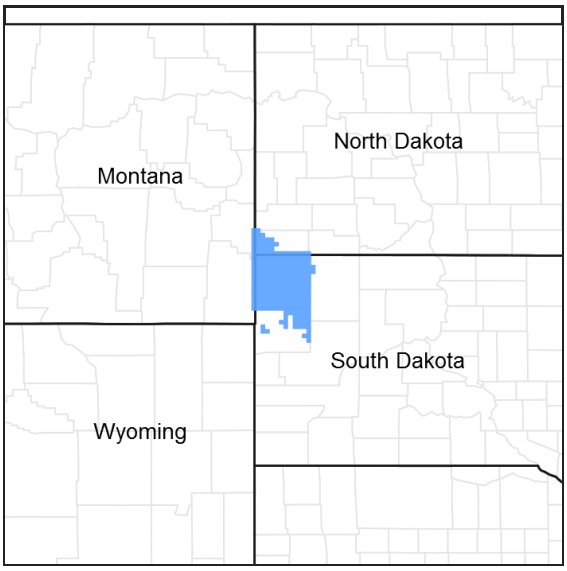


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

Classification relationships

Level IV Ecoregions of the Conterminous United States: 43e – Sagebrush Steppe.

Associated sites

R058DY008SD	**Sands**
R058DY009SD	**Sandy**
R058DY010SD	**Loamy**
R058DY011SD	**Clayey**
R058DY013SD	**Claypan**
R058DY024SD	**Shallow Loamy**

Similar sites

R058DY011SD	**Clayey** Clayey [more western wheatgrass; less blue grama; more productive]
R058DY010SD	**Loamy** Loamy [more blue grama; more big bluestem; more productive]

R058DY013SD	**Claypan** Claypan [more western wheatgrass; more cactus; more productive]

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Pascopyrum smithii* (2) *Bouteloua gracilis*

Physiographic features

This site occurs on nearly level to gently undulating or rolling uplands.

Table 2. Representative physiographic features

Landforms	(1) Terrace (2) Hill
Flooding frequency	None
Ponding frequency	None
Elevation	701–1,219 m
Slope	0–12%
Aspect	Aspect is not a significant factor

Climatic features

The climate in this MLRA is typical of the drier portions of the Northern Great Plains where sagebrush steppes to the west yield to grassland to the east. Annual precipitation ranges from 14 to 16 inches. Most of the rainfall occurs as frontal storms early in the growing season. Some high-intensity, convective thunderstorms occur the summer. Precipitation in winter occurs as snow. Temperatures show a wide range between summer and winter and between daily maximums and minimums, due to the high elevation and dry air, which permits rapid incoming and outgoing radiation. Outbreaks of cold air from Canada in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Extreme storms may occur during the winter, but most severely affect ranch operations during late winter and spring. The normal average annual temperature is about 44° F. January is the coldest month with average temperatures ranging from about 12° F (Marmarth, ND) to about 20° F (Baker, MT). July is the warmest month with temperatures averaging from about 70° F (Marmarth, ND) to about 76° F (Baker, MT). The range of normal average monthly temperatures between the coldest and warmest months is about 55° F. Hourly winds are estimated to average about 11 miles per hour annually, ranging from about 13 miles per hour during the spring to about 10 miles per hour during the summer. Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 50 miles per hour.

Growth of cool season plants begins in early to mid March, slowing or ceasing in late June. Warm season plants begin growth about mid May and can continue to early or mid September. Green up of cool season plants may occur in September and October when adequate soil moisture is present.

Table 3. Representative climatic features

Frost-free period (average)	123 days
Freeze-free period (average)	140 days
Precipitation total (average)	406 mm

Influencing water features

No significant water features influence this site.

Soil features

The soils in this site are well drained and formed in residuum from sandstone and shale. The fine sandy loam surface layer is one to four inches thick. The extremely hard clayey Btn horizon has round-topped or “bun shaped” columnar or a subangular blocky structure. These Btn horizons are high in sodium. The soils have a slow infiltration rate and very slow saturated hydraulic conductivity. Wet surface compaction can occur with heavy traffic. This site should show slight to no evidence of rills, wind scoured areas, or pedestalled plants. Water flow paths are broken, irregular in appearance, or discontinuous. The soil surface is stable and intact. These soils are mainly susceptible to water erosion. The hazard of water erosion increases on slopes greater than about nine percent.

Access Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm) for specific local soils information.

Table 4. Representative soil features

Surface texture	(1) Fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Very slow
Soil depth	51–102 cm
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0–10%
Available water capacity (0-101.6cm)	10.16–12.7 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	0–8 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–20
Soil reaction (1:1 water) (0-101.6cm)	6.1–9
Subsurface fragment volume <=3" (Depth not specified)	0–5%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

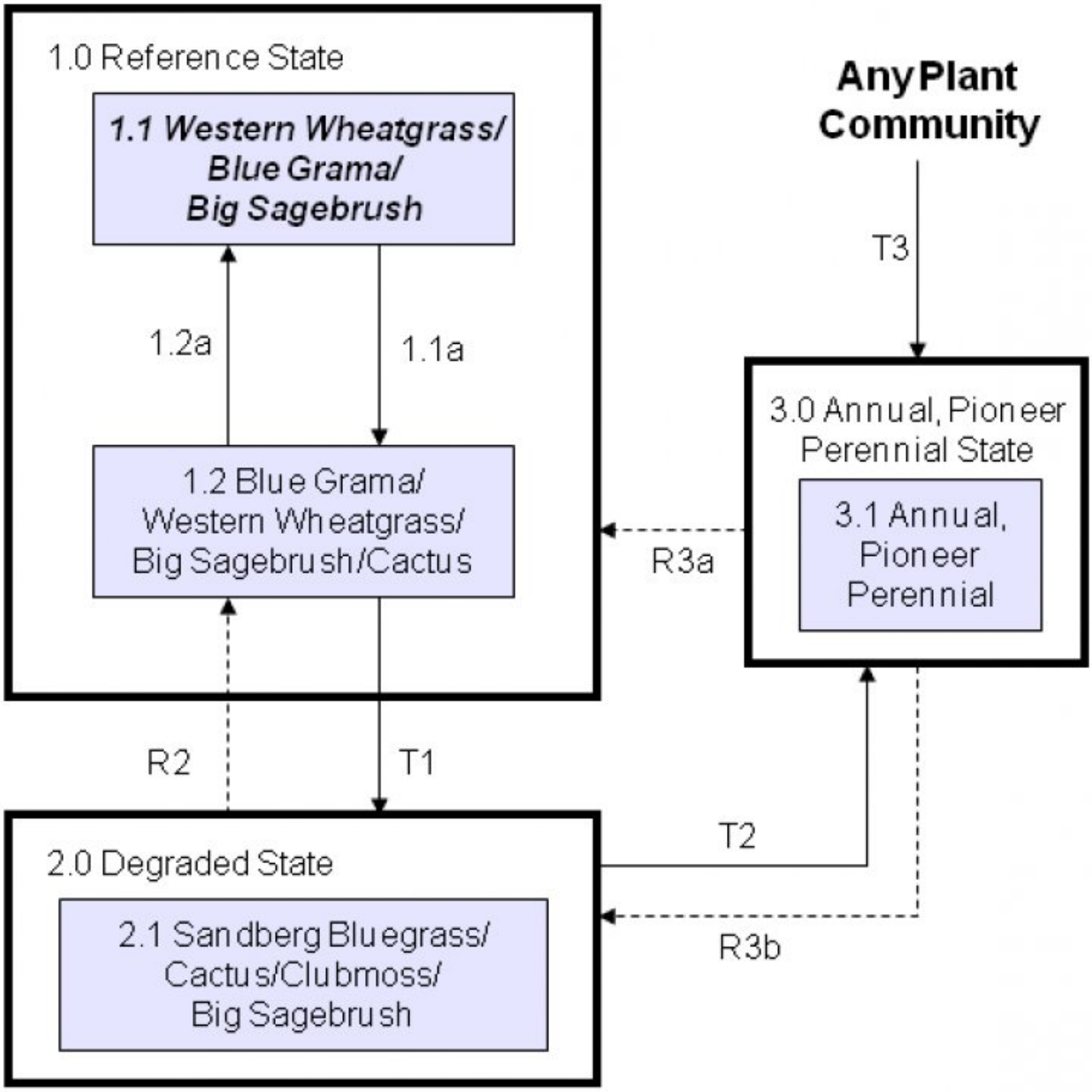
This site developed under Northern Great Plains climatic conditions, natural influences of large herbivores, occasional fire, and other biotic and abiotic factors that typically influence soil/site development. Changes will occur in the plant communities due to short-term weather variations, impacts of native and/or exotic plant and animal species, and management actions. While the following plant community descriptions describe more typical transitions between communities that will occur, severe disturbances, such as periods of well below average precipitation, can cause significant shifts in plant communities and/or species composition.

In association with this site are areas of slick spots that usually have considerably more bare ground, and are typically dominated by cactus. Slick spots are bare ground areas that are affected by high sodium concentrations. The soil factors are the dominant influence and grazing management is not necessarily the primary influence of these areas. These areas can occur as a complex with this site, sometimes being difficult to differentiate between the two.

The plant community upon which the interpretations are primarily based is the Western Wheatgrass/Blue Grama/Big Sagebrush Plant Community. This plant community has been determined by studying rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts also have been used. Plant communities, states, transitional pathways, and thresholds have been determined through similar studies and experience.

The following diagram illustrates the common plant communities and vegetation states commonly occurring on the site and the transition pathways between communities and states. The ecological processes are discussed in more detail in the plant community descriptions following the diagram.

State and transition model



State 1
Reference

The State narrative is under development.

Community 1.1
Western Wheatgrass/Blue Grama/Big Sagebrush

The plant community upon which interpretations are primarily based is the Western Wheatgrass/Blue Grama/Big Sagebrush Plant Community. This is also considered to be climax. This plant community can be found on areas having a history of proper grazing management, including adequate recovery periods between grazing events. The potential vegetation is about 75-85 percent grasses or grass-like plants, 5-10 percent forbs, and 5-15 percent shrubs. The rhizomatous wheatgrasses dominate the plant community, while blue grama is also prevalent. Other grasses and grass-like plants occurring on the site include needleandthread, buffalograss, Sandberg bluegrass, and sedges. Significant forbs include scarlet globemallow, cudweed sagewort, and heath aster. Shrubs occurring in this plant community include cactus, big sagebrush, saltbush, and fringed sagewort. This plant community is well adapted to the Northern Great Plains climatic conditions. Individual species can vary greatly in production depending on growing conditions (timing and amount of precipitation and temperature). Community dynamics, nutrient cycle, water cycle, and energy flow are functioning at the site's potential. Plant litter is properly distributed with some movement offsite and natural plant mortality is low. Low to moderate available water capacity coupled with high accumulations of sodium and slow permeability strongly influences the soil-water-plant relationships.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	482	735	986
Shrub/Vine	39	90	140
Forb	39	67	95
Moss	–	4	11
Total	**560**	**896**	**1232**

Figure 5. Plant community growth curve (percent production by month). SD5802, Northern Rolling High Plains, cool-season dominant, warm-season subdominant. Cool-season dominant, warm-season subdominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	23	34	15	6	5	4	0	0

Community 1.2
Blue Grama/Western Wheatgrass/Big Sagebrush/Cactus

This plant community can develop from the adverse effects of heavy continuous grazing and/or annual, continuous seasonal grazing. While western wheatgrass remains a subdominant, short grasses, big sagebrush, and cactus increase to become prominent and annual production decreases. Lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and high evaporation, which gives blue grama a competitive advantage over cool-season mid-grasses. This plant community can occur throughout the pasture, on spot grazed areas, and around water sources where season-long grazing patterns occur. Blue grama, western wheatgrass, and cactus are the dominant species, while big sagebrush can also express itself strongly. Other grasses and grass-likes occurring include sedge, buffalograss, inland saltgrass, needleandthread, prairie Junegrass, and annual grasses. Forbs such as brome snakeweed, cudweed sagewort, heath aster, and western yarrow may also be present. Some nonnative species will begin to invade this plant community including salsify, sweetclover, and annual bromes. There is usually more than 15 percent bare ground. This plant community is somewhat resilient. Runoff increases and infiltration will decrease. Soil erosion will be minimal due to the sod forming habit of blue grama. While less productive, a return to longer recovery periods and alternating season of use can easily result in a shift back to the Western Wheatgrass/Blue Grama/Big Sagebrush Plant Community.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	247	481	712
Shrub/Vine	62	135	207
Forb	28	50	73
Moss	–	7	17
Total	**337**	**673**	**1009**

Figure 7. Plant community growth curve (percent production by month). SD5803, Northern Rolling High Plains, cool-season/warm-season co-dominant.. Cool-season, warm-season co-dominant, uplands..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	20	28	21	10	5	3	0	0

Pathway 1.1a
Community 1.1 to 1.2

Continuous seasonal grazing and/or heavy continuous grazing during the active growing period of cool-season plants will lead to the Blue Grama/Western Wheatgrass/Big Sagebrush/Cactus Plant Community.

Pathway 1.2a
Community 1.2 to 1.1

Prescribed grazing, which allows for adequate plant recovery periods will move this plant community to the Western Wheatgrass/Blue Grama/Big Sagebrush Plant Community.

Conservation practices

Prescribed Grazing

State 2
Degraded

The State narrative is under development.

Community 2.1
Sandburg Bluegrass/Cactus/Clubmoss/Big Sagebrush

This plant community can develop from the adverse effects of heavy continuous grazing. Short grasses and cactus increase to dominate the site and annual production continues to decrease. Lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and high evaporation, which gives Sandberg bluegrass, cactus, and club moss a competitive advantage over cool-season midgrasses. This plant community can occur throughout the pasture, on spot grazed areas, and around water sources where season-long grazing patterns occur. Sandberg bluegrass and cactus are the dominant species. Other grasses and grass-likes occurring include blue grama, western wheatgrass, sedge, buffalograss, inland saltgrass, needleandthread, prairie Junegrass, and annual grasses. Forbs such as brome snakeweed, cudweed sagewort, heath aster, and western yarrow may also be present. Nonnative species will continue to invade this plant community including salsify, sweetclover, and annual bromes. There is usually more than 25 percent bare ground. This plant community is quite resilient. Reduced infiltration prevents the cool-season midgrasses from increasing and competing with the cactus and clubmoss. This plant community is less productive than the Blue Grama/Western Wheatgrass/Big Sagebrush/Cactus Plant Community. Runoff continues to increase and infiltration will decrease. Soil erosion will begin to be more evident and water flow patterns may be fairly obvious.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	179	267	409
Shrub/Vine	84	123	163
Forb	17	45	73
Moss	–	13	28
Total	**280**	**448**	**673**

Figure 9. Plant community growth curve (percent production by month). SD5803, Northern Rolling High Plains, cool-season/warm-season co-dominant.. Cool-season, warm-season co-dominant, uplands..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	20	28	21	10	5	3	0	0

State 3
Annual, Pioneer Perennial

The State narrative is under development.

Community 3.1
Annual, Pioneer Perennial Plant Community

This state can be reached whenever severe disturbance (i.e., abandoned farmland, severe continuous season-long grazing, frequent and severe defoliation by rodents, etc.) occurs. During the early successional stages, the species that mainly dominate are annual grasses and forbs, later being replaced by both native and introduced perennials. The vegetation on this site varies greatly, sometimes being dominated by threeawn, cheatgrass, crested wheatgrass, buffalograss, broom snakeweed, sweetclover and non-native thistles. Other plants that commonly occur on the site include wheatgrass, deathcamas, prickly lettuce, marestail, kochia, squirreltail, foxtail and sunflowers.

Transition T1
State 1 to 2

With heavy continuous grazing this plant community will move towards the Sandberg Bluegrass/Cactus/Clubmoss/Big Sagebrush Plant Community.

Transition T3
State 1 to 3

Cropped go-back with continuous grazing; heavy continuous grazing, and excessive defoliation may lead this plant community over a threshold to the Annual, Pionner Perennial State.

Transition T3
State 1 to 3

Cropped go-back with continuous grazing; heavy continuous grazing, and excessive defoliation may lead this plant community over a threshold to the Annual, Pionner Perennial State.

Restoration pathway R2
State 2 to 1

Long-term prescribed grazing and favorable climatic conditions, which allow for adequate plant recovery periods, may cause a shift to the Blue Grama/Western Wheatgrass/Big Sagebrush/Cactus Plant Community.

Conservation practices

Prescribed Grazing

Transition T2
State 2 to 3

Heavy, continuous season-long grazing, or frequent and severe defoliation (e.g., rodents) will move this plant community to the Annual, Pioneer Perennial Plant Community.

Transition T3
State 2 to 3

Cropped go-back with continuous grazing; heavy continuous grazing, and excessive defoliation may lead this plant community over a threshold to the Annual, Pionner Perennial State.

Restoration pathway R3a
State 3 to 1

Range seeding may shift this back a community resembling the Reference Plant Community.

Restoration pathway R3b
State 3 to 2

Long-term prescribed grazing will eventually shift this plant community to Sandberg Bluegrass/Cactus/Clubmoss/Big Sagebrush.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Rhizomatous Cool-Season Grasses**			224–359	
	western wheatgrass	PASM	*Pascopyrum smithii*	179–314	–
	Montana wheatgrass	ELAL7	*Elymus albicans*	18–90	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	18–90	–
2	**Short-Warm Season Grasses**			135–269	
	blue grama	BOGR2	*Bouteloua gracilis*	90–224	–
	saltgrass	DISP	*Distichlis spicata*	0–45	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–45	–
3	**Short Cool-Season Grasses**			45–135	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	9–45	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	9–45	–
	Sandberg bluegrass	POSE	*Poa secunda*	9–45	–
	plains reedgrass	CAMO	*Calamagrostis montanensis*	0–27	–
4	**Mid-Cool Season Grasses**			9–45	
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–45	–
	green needlegrass	NAVI4	*Nassella viridula*	0–27	–
5	**Warm-Season Bunchgrasses**			0–18	

5	**Warm-Season Bunchgrasses**			0–18	
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–18	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	0–9	–
6	**Miscellaneous Grasses**			0–27	
	Grass, perennial	2GP	*Grass, perennial*	0–27	–
	Grass, annual	2GA	*Grass, annual*	0–9	–
7	**Grass-Likes**			9–45	
	needleleaf sedge	CADU6	*Carex duriuscula*	9–45	–
	threadleaf sedge	CAFI	*Carex filifolia*	9–45	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–9	–
Forb					
9	**Forbs**			45–90	
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	9–27	–
	Forb, native	2FN	*Forb, native*	9–27	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	9–18	–
	pussytoes	ANTEN	*Antennaria*	9–18	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	9–18	–
	littlepod false flax	CAMI2	*Camelina microcarpa*	9–18	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	9–18	–
	bighead pygmycudweed	EVPR	*Evax prolifera*	9–18	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	9–18	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–18	–
	white heath aster	SYER	*Symphyotrichum ericoides*	9–18	–
	spiny phlox	PHHO	*Phlox hoodii*	9–18	–
	woolly plantain	PLPA2	*Plantago patagonica*	9–18	–
	scurfpea	PSORA2	*Psoralidium*	9–18	–
	cinquefoil	POTEN	*Potentilla*	0–9	–
	American vetch	VIAM	*Vicia americana*	0–9	–
	Nuttall's violet	VINU2	*Viola nuttallii*	0–9	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–9	–
	tarragon	ARDR4	*Artemisia dracunculus*	0–9	–
	onion	ALLIU	*Allium*	0–9	–
Shrub/Vine					
10	**Shrubs**			45–135	
	big sagebrush	ARTR2	*Artemisia tridentata*	18–90	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	9–27	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–27	–
	silver sagebrush	ARCA13	*Artemisia cana*	9–27	–
	prairie sagewort	ARFR4	*Artemisia frigida*	9–27	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	9–18	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–18	–
	saltbush	ATRIP	*Atriplex*	9–18	–
	spinystar	ESVIV	*Escobaria vivipara var. vivipara*	0–9	–

	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–9	–
Lichen					
11	**Cryptogams**			0–9	
	lesser spikemoss	SEDE2	*Selaginella densa*	0–9	–

Table 9. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Rhizomatous Cool-Season Grasses**			34–101	
	western wheatgrass	PASM	*Pascopyrum smithii*	34–101	–
	Montana wheatgrass	ELAL7	*Elymus albicans*	0–34	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–34	–
2	**Short-Warm Season Grasses**			135–235	
	blue grama	BOGR2	*Bouteloua gracilis*	101–235	–
	saltgrass	DISP	*Distichlis spicata*	7–54	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–34	–
3	**Short Cool-Season Grasses**			34–67	
	Sandberg bluegrass	POSE	*Poa secunda*	13–54	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–34	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	7–34	–
5	**Warm-Season Bunchgrasses**			0–34	
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–34	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	0–20	–
6	**Miscellaneous Grasses**			0–20	
	Grass, annual	2GA	*Grass, annual*	0–20	–
	Grass, perennial	2GP	*Grass, perennial*	0–20	–
7	**Grass-Likes**			13–67	
	needleleaf sedge	CADU6	*Carex duriuscula*	7–54	–
	threadleaf sedge	CAFI	*Carex filifolia*	7–54	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–7	–
8	**Non-Native Grasses**			7–34	
	cheatgrass	BRTE	*Bromus tectorum*	7–34	–
Forb					
9	**Forbs**			34–67	
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	7–34	–
	Forb, introduced	2FI	*Forb, introduced*	7–34	–
	sweetclover	MELIL	*Melilotus*	0–34	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	7–27	–
	scurfpea	PSORA2	*Psoralidium*	7–27	–
	spiny phlox	PHHO	*Phlox hoodii*	7–20	–
	woolly plantain	PLPA2	*Plantago patagonica*	7–20	–

	wavyleaf thistle	CIUN	*Cirsium undulatum*	7–20	–
	bighead pygmycudweed	EVPR	*Evax prolifera*	7–20	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–20	–
	Forb, native	2FN	*Forb, native*	7–20	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	7–20	–
	pussytoes	ANTEN	*Antennaria*	7–20	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	7–20	–
	white heath aster	SYER	*Symphyotrichum ericoides*	7–20	–
	yellow salsify	TRDU	*Tragopogon dubius*	0–20	–
	Nuttall's violet	VINU2	*Viola nuttallii*	0–13	–
	littlepod false flax	CAMI2	*Camelina microcarpa*	7–13	–
	field sagewort	ARCA12	*Artemisia campestris*	0–13	–
	onion	ALLIU	*Allium*	0–13	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–13	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–13	–
Shrub/Vine					
10	**Shrubs**			67–202	
	big sagebrush	ARTR2	*Artemisia tridentata*	13–101	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	7–54	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	13–54	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–34	–
	silver sagebrush	ARCA13	*Artemisia cana*	7–34	–
	prairie sagewort	ARFR4	*Artemisia frigida*	13–34	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–20	–
	spinystar	ESVIV	*Escobaria vivipara var. vivipara*	0–7	–
Moss					
11	**Cryptogams**			0–13	
	lesser spikemoss	SEDE2	*Selaginella densa*	0–13	–

Table 10. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Rhizomatous Cool-Season Grasses**			4–45	
	western wheatgrass	PASM	*Pascopyrum smithii*	4–45	–
	Montana wheatgrass	ELAL7	*Elymus albicans*	0–9	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–9	–
2	**Short-Warm Season Grasses**			22–67	
	blue grama	BOGR2	*Bouteloua gracilis*	22–67	–
	saltgrass	DISP	*Distichlis spicata*	9–45	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–22	–
3	**Short Cool-Season Grasses**			22–81	
	Sandberg bluegrass	POSE	*Poa secunda*	9–67	–
	prairie junegrass	KOMA	*Koeleria macrantha*	4–13	

	prairie Junegrass	KOMA	*Koeleria macrantha*	4–13	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–9	–
5	**Warm-Season Bunchgrasses**			0–22	
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–22	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	0–13	–
6	**Miscellaneous Grasses**			0–13	
	Grass, annual	2GA	*Grass, annual*	0–13	–
	Grass, perennial	2GP	*Grass, perennial*	0–13	–
7	**Grass-Likes**			9–67	
	needleleaf sedge	CADU6	*Carex duriuscula*	4–45	–
	threadleaf sedge	CAFI	*Carex filifolia*	4–45	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–4	–
8	**Non-Native Grasses**			4–36	
	cheatgrass	BRTE	*Bromus tectorum*	4–36	–
Forb					
9	**Forbs**			22–67	
	sweetclover	MELIL	*Melilotus*	0–40	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	4–36	–
	scurfpea	PSORA2	*Psoralidium*	4–31	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–27	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	4–22	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	4–22	–
	bighead pygmycudweed	EVPR	*Evax prolifera*	4–22	–
	spiny phlox	PHHO	*Phlox hoodii*	4–22	–
	woolly plantain	PLPA2	*Plantago patagonica*	4–22	–
	Forb, introduced	2FI	*Forb, introduced*	4–22	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	4–22	–
	pussytoes	ANTEN	*Antennaria*	4–22	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	4–22	–
	white heath aster	SYER	*Symphyotrichum ericoides*	4–22	–
	yellow salsify	TRDU	*Tragopogon dubius*	0–22	–
	field sagewort	ARCA12	*Artemisia campestris*	0–18	–
	onion	ALLIU	*Allium*	0–18	–
	Forb, native	2FN	*Forb, native*	4–13	–
	littlepod false flax	CAMI2	*Camelina microcarpa*	4–9	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–9	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–9	–
	Nuttall's violet	VINU2	*Viola nuttallii*	0–9	–
Shrub/Vine					
10	**Shrubs**			90–157	
	big sagebrush	ARTR2	*Artemisia tridentata*	9–67	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	22–67	–

	plains pricklypear	OPPO	*Opuntia polyacantha*	22–67	–
	prairie sagewort	ARFR4	*Artemisia frigida*	9–36	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–36	–
	silver sagebrush	ARCA13	*Artemisia cana*	4–22	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–13	–
	spinystar	ESVIV	*Escobaria vivipara var. vivipara*	0–4	–
Moss					
11	**Cryptogams**			0–27	
	lesser spikemoss	SEDE2	*Selaginella densa*	0–27	–

Animal community

Animal Community – Wildlife Interpretations
Major Land Resource Area 58D lies within the drier portion of Northern mixed-grass prairie ecosystem where sagebrush steppes to the west yield to grassland steppes to the east. Prior to European settlement, this area consisted of diverse grass/shrub land habitats interspersed with varying densities of depressional, instream wetlands and woody riparian corridors. These habitats provided critical life cycle components for many of its users. Many species of grassland birds, small mammals, reptiles, amphibians, and herds of roaming bison, elk, and pronghorn were among the inhabitants adapted to this semi-arid region. Roaming herbivores, as well as, several small mammal and insect species, were the primary consumers linking the grassland resources to predators such as the wolf, mountain lion, and grizzly bear, as well as, smaller carnivores such as the coyote, bobcat, fox, and raptors. The black-tailed prairie dog was once abundant; however, the species remains a keystone species within its range. The black-footed ferret, burrowing owl, ferruginous hawk, mountain plover, and swift fox were associated with prairie dog complexes.

Historically, the Northern mixed-grass prairie was a disturbance-driven ecosystem with fire, herbivory and climate functioning as the primary disturbance factors either singly or in combination. Following European settlement, livestock grazing, cropland conversion, elimination of fire, energy development, and other anthropogenic factors influenced species composition and abundance. Introduced and invasive species further impacted plant and animal communities. Bison were historically a keystone species but have been extirpated as a free-ranging herbivore. The loss of the bison, reduction of prairie dog colonies, and loss of fire as ecological drivers greatly influenced the character of the remaining native plant communities and altered wildlife habitats. Human development has reduced habitat quality for area-sensitive species.

Within MLRA 58D, the Thin Claypan Ecological Site (ES) provides upland grassland cover with an associated forb and shrub component. It was typically part of an expansive grassland landscape that included combinations of Shallow Loamy, Shallow Clayey, Thin Loamy, Claypan, Sandy Claypan, Sandy, Loamy, and Clayey ESs. This site provided habitat for species requiring unfragmented grassland. Important habitat features and components found commonly or exclusively on this site may include greater sage-grouse and sharp-tailed grouse leks; upland nesting habitat for grassland birds, forbs, and insects for brood habitat; and a forage source for small and large herbivores. Many grassland and shrub steppe nesting bird populations are declining. Extirpated species include free-ranging bison, grizzly bear, gray wolf, black-footed ferret, mountain plover, Rocky Mountain locust, and swift fox.

The majority of the Thin Claypan ES remains intact and provides increasingly important habitat for grassland and shrub steppe nesting birds, small rodents, the coyote, and a variety of reptiles, amphibians, and insects. Invasive species such as annual bromegrasses and crested wheat have impacted the biological integrity of the site for some grassland birds such as greater-sage grouse. Changes in historic fire regime and domestic grazing have impacted the forb/shrub/grass percentages. Greater sage-grouse and Brewer’s sparrow benefit when big sagebrush increases.

Western Wheatgrass/Blue Grama/Big Sagebrush: The predominance of grasses plus high diversity of forbs and shrubs in this community favors grazers and mixed-feeders, such as deer, and pronghorn. Insects, such as pollinators, play a large role in maintaining the forb community and provide a forage base for grassland birds and other species. The complex plant structural diversity provides habitat for a wide array of migratory and resident birds. Brewer’s and grasshopper sparrow, lark bunting, western meadowlark, greater sage-grouse, and sharp-tailed

grouse are common and benefit from the structure and composition this plant community provides.

This ES provides important breeding habitat for loggerhead shrikes. This site provides excellent nesting and brood rearing habitat for greater sage-grouse and sharp-tailed grouse. Diverse prey populations are available for grassland raptors such as ferruginous hawk, Swainson's hawk, golden eagle, and prairie falcon.

The diversity of grasses, forbs, and shrubs provide high nutrition levels for small and large herbivores including voles, mice, thirteen lined ground squirrels, white-tailed jackrabbit, and deer. This ES provides excellent wintering habitat for pronghorn. The moderate stature of this plant community provides suitable thermal, protective, and escape cover for small herbivores and grassland birds. Predators utilizing this plant community include the coyote, American badger, red fox, and long-tailed weasel. This plant community provides habitat for spade foot toad, Great Plains toad, bull snake, and western rattlesnake.

Blue Grama/Western Wheatgrass/Big Sagebrush/Cactus: This plant community develops after an extended period of continuous grazing by herbivores and exclusion of fire favoring nonnative grasses such as annual bromegrasses, and the expansion of woody species such as big sage brush. The predominance of grasses, but a lower diversity of forbs and an increase in shrub cover, favors grazers and mixed-feeders, such as deer, pronghorn, and small mammals. Insects, such as pollinators, play a large role in maintaining the forb community and provide a forage base for grassland birds and other species. Chestnut-collared longspur, Brewer's and vesper sparrow, long-billed curlew, and western meadowlark, are common and benefit from the structure and composition this plant community provides. The big sagebrush benefits pronghorn, as well as, greater sage-grouse nesting and brood rearing. Prey populations are likely less dense but may be more available for grassland raptors such as ferruginous hawk, Swainson's hawk, and northern harrier. This plant community provides lower quality habitat for Great Plains toad, bull snake, and western rattlesnake.

Sandberg Bluegrass/Cactus/Clubmoss/Big Sagebrush: Resulting from continued heavy continuous season-long grazing without adequate recovery periods between grazing events or no fire for extended periods of time, Sandberg bluegrass will dominate. The forb diversity has decreased with cactus and clubmoss dominating the site. Annual bromegrasses are prevalent on this site. Increase in bare ground will increase soil erosion and sediment loads to associated water features. A shift to shorter plant structure will favor prairie dog expansion and associate species such as ferruginous hawk, burrowing owl, mountain plover, and swift fox.

Sharp-tailed grouse and greater sage-grouse may use this site for leks due to the shorter height structure. The plant community provides high early season nutrition value for white-tailed jackrabbit, deer, and pronghorn. The short stature of this plant community limits suitable thermal, protective, and escape cover. Predators utilizing this plant community include coyote, American badger, red fox, and long-tailed weasel.

Extreme impairment of the ecological processes impacts offsite aquatic habitats through excessive runoff, nutrient, and sediment loads. Elevated surface temperatures resulting from reduced cover and litter will eliminate habitat for most amphibian species, as well as, most grassland birds and mammals. The earlier green-up associated with Sandberg bluegrass will provide foraging habitat for upland sandpipers. The short stature provides habitat for killdeer, horned lark, white-tailed jackrabbit, and thirteen-lined ground squirrel species. Prey populations are limited due to increased vulnerability to raptor and mammalian predation.

Annual/Pioneer Plant Community: This plant community develops under severe disturbance and/or excessive defoliation. This can result from heavy livestock, prairie dog concentration, or cropping abandonment (go-back land). The dominant vegetation includes pioneer annual grasses, forbs, invaders, and early successional biennial and perennial species. Plant species from adjacent ESs may become minor components of this plant community. The community is susceptible to invasion of annual bromegrasses, crested wheatgrass, and other nonnative species due to severe soil disturbances and relatively high percent of bare ground.

Soil erosion is potentially high, impacting offsite aquatic habitats through increased runoff, nutrient, and sediment loads. Reduced surface cover, low plant density, low plant vigor, loss of root biomass, and soil compaction, all contribute to decreased wildlife abundance and diversity.

Since secondary succession is highly variable plant and wildlife species will vary. This plant community provides habitat for generalist or early successional species. In addition, these communities may contain prairie dog towns. Prairie dog towns are sites of high plant and wildlife diversity.

Animal Community – Grazing Interpretations
As this site improves in condition through proper management (from the more short grass dominated plant communities to the interpretive plant community), the advantage for livestock production includes: higher forage production from cool-season grasses, improved early spring forage production, and higher water infiltration. The disadvantage for livestock include: reduction in cool-/warm-season grass mix which would provides better management flexibility, less plant diversity, and a potential increase in soil erosion. The Annual, Pioneer Perennial Plant Community is of limited value for livestock production.

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide yearlong forage. During the dormant period, the forage for livestock will likely be lacking protein to meet livestock requirements, and added protein will allow ruminants to better utilize the energy stored in grazed plant materials. A forage quality test (either directly or through fecal sampling) should be used to determine the level of supplementation needed.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group D. Infiltration and runoff potential for this site varies from moderate to high depending on soil hydrologic group, slope, and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An exception would be where shortgrasses form a strong sod and dominate the site. Normally, areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff (refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves).

Recreational uses

This site provides hunting opportunities for upland game species. The wide variety of plants which bloom from spring until fall have an esthetic value that appeals to visitors.

Wood products

No appreciable wood products are typically present on this site.

Other products

Seed harvest of native plant species can provide additional income on this site.

Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations and experience were also used. Those involved in developing this site description include: Ryan Beer, Range Management Specialist (RMS), NRCS; Chuck Berdan, Biologist (BIO), Bureau of Land Management (BLM); Stan Boltz, RMS, NRCS; Dave Dewald, Wildlife BIO, NRCS; Jody Forman, RMS, NRCS; Dennis Froemke, RMS, NRCS; Tom Juntti, BIO, US Forest Service (USFS); Cheryl Nielsen, RMS, NRCS; Jeff Printz, RMS, NRCS; Mike Stirling, RMS, NRCS; Dan Svingen, BIO, USFS; Darrell Vanderbusch, Soil Scientist, NRCS; Cindy Zachmeier, BIO, NRCS; and Tim Zachmeier, BIO, BLM.

There are 2 SCS-RANGE-417's collected from 1981-1985 in Harding County, South Dakota.

Other references

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Contributors

Stan Boltz
Travis Patient

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	Stan Boltz, Ryan Beer, Mitch Iverson, Thad Berrett, Cheryl Nielsen
Contact for lead author	stanley.boltz@sd.usda.gov, 605-352-1236
Date	05/07/2010
Approved by	Stan Boltz
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None.

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2. **Presence of water flow patterns:** Broken or irregular in appearance or discontinuous with numerous debris dams.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals are somewhat common, but few exposed roots would occur.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 10 to 30 percent is typical; this does not include associated slickspots that are not a soil/ecological site.

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5. **Number of gullies and erosion associated with gullies:** None should be present.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None.

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7. **Amount of litter movement (describe size and distance expected to travel):** Small size litter classes will generally

move short distances, some medium size class litter will move very short distances. Litter debris dams are occasionally present.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil aggregate stability ratings should typically be 3 or greater. Surface organic matter adheres to the soil surface in most cases. Soil surface fragments will typically retain structure for short periods when dipped in distilled water. Some fragments will dissolve in less than 1 minute.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** A-horizon not present at the surface, but has light colored E-horizon 1 to 4 inches thick. Structure is thin platy parting to fine granular.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Combination of shallow and deep rooted species (mid & tall rhizomatous and tufted perennial cool-season grasses) with fine and coarse roots positively influences infiltration.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None – natural pan appears at roughly 1 to 4 inches with “biscuit-top” appearance at top of pan.

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant: Mid cool-season rhizomatous grasses > Short warm-season grasses >

    Sub-dominant: Mid/short cool-season grasses = Shrubs >

    Other: Forbs > Tall cool-season grasses = Grass-likes

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very little evidence of decadence or mortality. Bunch grasses have strong, healthy centers and shrubs are vigorous.

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14. **Average percent litter cover (%) and depth (in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Production ranges from 500-1,100 lbs./acre (air-dry weight). Reference value production is 800 lbs./acre (air-dry weight).

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** State and local noxious weeds, cactus

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17. **Perennial plant reproductive capability:** All species exhibit high vigor relative to climatic conditions. Do not rate based solely on seed production. Perennial grasses should have vigorous rhizomes or tillers.
