

Ecological site R058DY027SD

Sandy Claypan

Accessed: 05/18/2024

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

R058DY009SD	Sandy
R058DY010SD	Loamy

Similar sites

R058DY009SD	Sandy Sandy [more warm-season grasses; more production]
R058DY010SD	Loamy Loamy [more western wheatgrass; less needleandthread; more production]

Table 1. Dominant plant species

Tree	Not specified
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Shrub	Not specified
Herbaceous	(1) <i>Hesperostipa comata</i> ssp. <i>comata</i> (2) <i>Calamovilfa longifolia</i>

Physiographic features

This site occurs on nearly level to gently sloping uplands.

Table 2. Representative physiographic features

Landforms	(1) Fan (2) Terrace
Flooding frequency	None
Ponding frequency	None
Elevation	701–1,219 m
Slope	1–6%
Water table depth	203 cm
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 in 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, North Dakota (ND)), to about 20°F (Baker, Montana (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 (mph) annually, ranging from about 13 mph during the spring to about 10 mph during the summer. Daytime winds are generally stronger than nighttime and strong storms may bring brief periods of high winds with gusts to more than 50 mph.

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. Greenup 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 common features of soils in this site are the sandy loam to sandy clay loam textured subsoils and slopes of one

to six percent. The soils in this site are well-drained and formed in loamy alluvium. The fine sandy loam surface layer is 5 to 14 inches thick. The soils have a moderate infiltration rate. 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 with numerous debris dams or vegetative barriers. The soil surface is stable and intact. Subsurface soil layers are restrictive to water movement and root penetration.

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 to slow
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	10.16–12.7 cm
Calcium carbonate equivalent (0-101.6cm)	0–10%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–25
Soil reaction (1:1 water) (0-101.6cm)	5.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

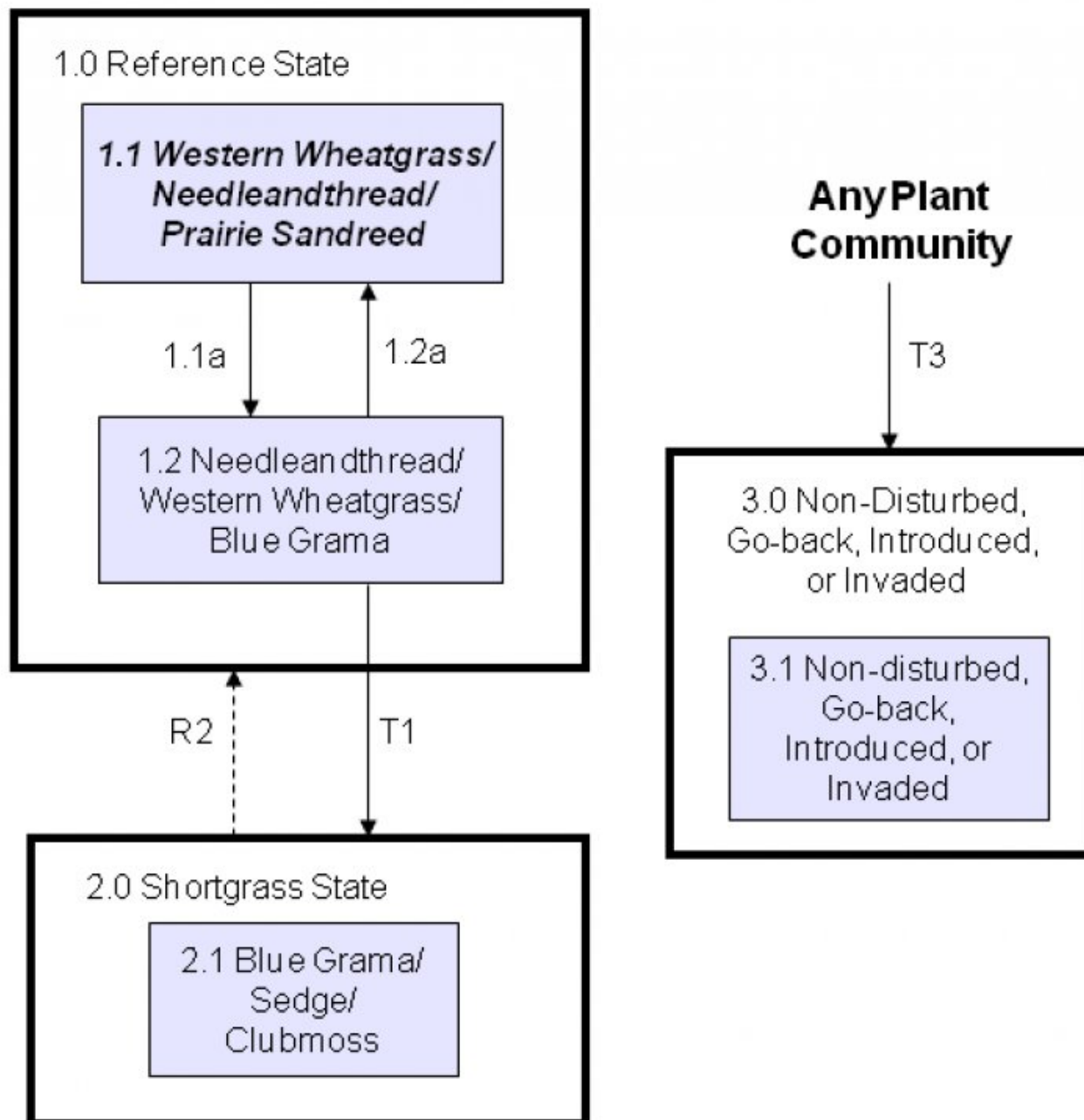
This site developed under Northern Great Plains climatic conditions, natural influences of large herbivores, occasional fire, and other biotic and abiotic factors that typically influence soil/site development. Changes will occur in the plant communities due to short-term weather variations, impacts 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.

Continuous grazing without adequate recovery periods following each grazing occurrence over several years causes this site to depart from the Western Wheatgrass/Needleandthread/Prairie Sandreed Plant Community. Species such as blue grama, sedges, cudweed sagewort, hairy golden aster, prairie coneflower, scurfpea, and fringed sagewort will initially increase. Prairie sandreed, sand bluestem, western wheatgrass, green needlegrass, false gromwell, vetch, penstemon, and leadplant will decrease in frequency and production. In time, heavy continuous grazing will likely cause upland sedges and blue grama to dominate and pioneer perennials, annuals, and club moss to increase. This plant community is relatively stable and the competitive advantage prevents other species from establishing.

The plant community upon which interpretations are primarily based is the Western Wheatgrass/Needleandthread/Prairie Sandreed 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 is a diagram that illustrates the common plant communities that can occur on the site and the transition pathways between communities. 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/Needleandthread/Prairie Sandreed

The interpretive plant community for this site is the Western Wheatgrass/Needleandthread/Prairie Sandreed Plant Community. This is also considered to be climax. This plant community can be found on areas that are properly managed with grazing and/or prescribed burning and sometimes on areas receiving occasional short periods of deferment. The potential vegetation is about 80 to 90 percent grasses or grass-like plants, 5 to 10 percent forbs, 5 to 10 percent shrubs, and 0 to 1 percent cryptogams. The major grasses include western wheatgrass, needleandthread, and prairie sandreed. Other grasses or grass-like species occurring on the site include green needlegrass, sand bluestem, little bluestem, blue grama, prairie Junegrass, and sedges. Significant forbs include cudweed sagewort, dotted gayfeather, hairy goldaster, prairie clover, and scurfpea. The significant shrubs that occur include rose, fringed sagewort, and silver sagebrush. 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). The diversity in plant species allows for high drought tolerance. This is a healthy and sustainable plant community. Moderate or high available water capacity provides a favorable soil-water-plant relationship. Overall, the interpretive plant community has the appearance of being stable, diverse, and productive. Plant litter is properly distributed with very little movement offsite and natural plant mortality is very low.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1065	1515	2074
Forb	84	135	185
Shrub/Vine	84	135	185
Moss	—	9	22
Total	1233	1794	2466

**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 Needleandthread/Western Wheatgrass/Blue Grama

This plant community develops under heavy continuous grazing or continuous seasonal grazing (grazing at the same time of year every year). The potential vegetation is made up of approximately 80 to 90 percent grasses and grass-like species, 5 to 10 percent forbs, 5 to 10 percent shrubs, and 0 to 3 percent cryptogams. The dominant grasses include needleandthread, western wheatgrass, blue grama, sedge, and little bluestem. Other grasses or grass-like species may include prairie sandreed, sand dropseed, and prairie Junegrass. Significant forbs include cudweed sagewort, green sagewort, scurfpea, western yarrow, and white prairie aster. The dominant shrubs that occur include silver sagebrush, cactus, rose, and fringed sagewort. Compared to the Western Wheatgrass/Needleandthread/Prairie Sandreed Plant Community, species such as needleandthread, blue grama, little bluestem, and threadleaf sedge have increased. Prairie sandreed, western wheatgrass, sand bluestem, and big bluestem have decreased in composition. Annual bromes, bluegrass, sweetclover, and other annual grasses and forbs can invade the site. This plant community can occur in a mosaic with patchy, slightly used areas occurring adjacent to and intermingled with this plant community. This plant community is not resistant to change. Changes in grazing management can result in a shift to another plant community. This community is fairly resilient following normal disturbances because of the high diversity of plant species and the high amount of litter. Soil erosion is low. The water cycle is functioning due to the litter cover on the soil surface. Infiltration is high because of the soil texture and surface litter.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	773	1123	1457
Forb	62	101	146
Shrub/Vine	62	101	146
Moss	—	20	45
Total	897	1345	1794

Figure 7. 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

Pathway 1.1a Community 1.1 to 1.2

Heavy continuous grazing or continuous seasonal grazing (grazing at the same time of year every year) for extended periods during the actively growing period of the dominant grasses without adequate recovery periods will lead to the Needleandthread/Western Wheatgrass/Blue Grama Plant Community. This occurs with exposure to herbivory during the entire or a major portion of the growing season at moderate to heavy stocking rates.

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/Needleandthread/Prairie Sandreed Plant Community.

Conservation practices

Prescribed Grazing

State 2 Shortgrass

The State narrative is under development.

Community 2.1 Blue Grama/Sedge/Clubmoss

This plant community can develop from the adverse effects of heavy, continuous grazing and/or annual, early spring seasonal grazing. Annual grazing too early in the spring depletes stored carbohydrates, resulting in weakening and eventual death of the cool-season mid-grasses. Short grasses and grass-like and forbs increase to dominate the site and annual production decreases dramatically. Lack of litter and reduced plant vigor result in higher soil temperatures, poor water infiltration rates, and high evapotranspiration, which gives blue grama and sedges 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 and sedge are the dominant species. Clubmoss is not dominant by weight but occupies a significant amount of the surface cover of the plant community. Other grasses that may be present include Sandberg bluegrass, red threeawn, needleandthread, prairie Junegrass, and annual grasses. Forbs such as cudweed sagewort, green sagewort, goldenrod, white prairie aster, and scurfpea may also be present. There is usually less than 10 percent bare ground. This plant community is relatively stable. The thick sod and competitive advantage prevents other species from establishing. This plant community is less productive than the Western Wheatgrass/Needleandthread/Prairie Sandreed Plant Community. Runoff increases and infiltration will decrease. Soil erosion will be minimal due to the sod forming habit of blue grama.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	465	816	1160
Forb	45	86	135
Shrub/Vine	45	76	106
Moss	6	30	56
Total	561	1008	1457

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

Non-Disturbed, Go-back, Introduced, or Invaded

The State narrative is under development.

Community 3.1

Non-Disturbed, Go-back, Introduced, or Invaded

This group includes four separate vegetation states that are highly variable in nature. They are derived through four distinct management scenarios, and are not related successional. Infiltration, runoff and soil erosion vary depending on the vegetation present on the site. The Non-Disturbed state develops from extended periods of exclusion by large herbivores, fire suppression and lack of other surface disturbance. Plant litter accumulates in large amounts when this community first develops. Litter buildup reduces mature plant vigor and density, and seedling recruitment declines. Eventually litter levels become high enough that plant density decreases. Interspaces are commonly filled by annual forbs, annual grasses, and cryptogams. Typically rhizomatous grasses form small colonies because of a lack of tiller stimulation. The Go-back state can be reached whenever severe mechanical disturbance (i.e., abandoned farmland) 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 sand dropseed, threeawn, annual brome, crested wheatgrass, broom snakeweed, sweetclover and non-native thistles. Other plants that commonly occur on the site include western wheatgrass, prickly lettuce, maretail, kochia, bottlebrush squirreltail, foxtail and annual sunflower. If remnant populations are sufficient, western wheatgrass can sometimes rapidly occupy this state. The Introduced state is normally those areas seeded to crested wheatgrass, pubescent or intermediate wheatgrass and alfalfa. They require considerable investment to establish and have a variable life expectancy. They do produce up to 50% more than native range, but their value as forage is somewhat limited due to the single species usually seeded. The Invaded state includes areas that have been invaded by species such as smooth brome, Kentucky bluegrass, crested wheatgrass, non-native thistles, field bindweed, knapweeds, leafy spurge, hoary cress and other introduced species.

Transition T1

State 1 to 2

With continuous seasonal grazing or heavy continuous grazing, this plant community will move towards the Blue Grama/Sedge/Clubmoss Plant Community.

Transition T3

State 1 to 3

Cropped go-back; heavy continuous seasonal grazing, or an extended period of non-use & no fire may lead this

plant community over a threshold to the Non-Disturbed, Go-back, Introduced, or Invaded State.

Transition T3

State 1 to 3

Cropped go-back; heavy continuous seasonal grazing, or an extended period of non-use & no fire may lead this plant community over a threshold to the Non-Disturbed, Go-back, Introduced, or Invaded State.

Restoration pathway R2

State 2 to 1

With long-term prescribed grazing and favorable climatic conditions, which allow for adequate plant recovery periods, this plant community may eventually shift to the Needleandthread/Western Wheatgrass/Blue Grama Plant Community.

Conservation practices

Prescribed Grazing

Transition T3

State 2 to 3

Cropped go-back; heavy continuous seasonal grazing, or an extended period of non-use & no fire may lead this plant community over a threshold to the Non-Disturbed, Go-back, Introduced, or Invaded State.

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 Wheatgrass			359–538	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	359–538	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus ssp. lanceolatus</i>	0–90	–
2	Mid/Tall Cool-Season Bunchgrasses			179–448	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	179–448	–
	green needlegrass	NAV14	<i>Nassella viridula</i>	0–90	–
3	Tall Warm-Season Grasses			90–359	
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	90–269	–
	sand bluestem	ANHA	<i>Andropogon hallii</i>	0–90	–
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–54	–
4	Short-Warm Season Grasses			18–90	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	18–90	–
	saltgrass	DISP	<i>Distichlis spicata</i>	0–18	–
	Fendler threeawn	ARPUL	<i>Aristida purpurea var. longiseta</i>	0–18	–
5	Warm-Season Bunchgrasses			18–90	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–90	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–90	–
6	Miscellaneous Native Grasses			36–126	
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	18–90	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var.</i>	18–54	–

			<i>scribnerianum</i>		
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0–36	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	0–18	–
7	Grass-Likes			18–90	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	18–90	–
	sun sedge	CAINH2	<i>Carex inops</i> ssp. <i>heliophila</i>	0–54	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–54	–
Forb					
9	Forbs			90–179	
	Forb, native	2FN	<i>Forb, native</i>	0–54	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	18–54	–
	western yarrow	ACMIO	<i>Achillea millefolium</i> var. <i>occidentalis</i>	18–36	–
	prairie clover	DALEA	<i>Dalea</i>	18–36	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	18–36	–
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	18–36	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	18–36	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	18–36	–
	white prairie aster	SYFA	<i>Symphyotrichum falcatum</i>	18–36	–
	longbract spiderwort	TRBR	<i>Tradescantia bracteata</i>	18–36	–
	scurfpea	PSORA2	<i>Psoralegium</i>	18–36	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–18	–
	Missouri goldenrod	SOMI2	<i>Solidago missouriensis</i>	0–18	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0–18	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0–18	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	0–18	–
	beardtongue	PENST	<i>Penstemon</i>	0–18	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–18	–
	cinquefoil	POTEN	<i>Potentilla</i>	0–18	–
	sanddune wallflower	ERCAC	<i>Erysimum capitatum</i> var. <i>capitatum</i>	0–18	–
	scarlet beeblossom	GACO5	<i>Gaura coccinea</i>	0–18	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	0–18	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	0–18	–
Shrub/Vine					
10	Shrubs			90–179	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–90	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	18–90	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	18–54	–
	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	0–54	–
	rose	ROSA5	<i>Rosa</i>	18–54	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	18–36	–
	brittle pricklypear	OPFR	<i>Opuntia fragilis</i>	0–18	–
Moss					
11	Cryptogams			0–18	

11	Cryptogams			0–18	
	lesser spikemoss	SEDE2	<i>Selaginella densa</i>	0–18	–

Table 9. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Rhizomatous Wheatgrass			67–269	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	67–269	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus ssp. lanceolatus</i>	0–67	–
2	Mid/Tall Cool-Season Bunchgrasses			202–404	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	202–404	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–13	–
3	Tall Warm-Season Grasses			0–67	
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	0–67	–
	sand bluestem	ANHA	<i>Andropogon hallii</i>	0–13	–
4	Short-Warm Season Grasses			67–202	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	67–202	–
	saltgrass	DISP	<i>Distichlis spicata</i>	0–40	–
	Fendler threeawn	ARPUL	<i>Aristida purpurea var. longiseta</i>	0–40	–
5	Warm-Season Bunchgrasses			13–108	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	13–108	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–67	–
6	Miscellaneous Native Grasses			27–94	
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	13–54	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthos var. scribnerianum</i>	13–40	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0–27	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	0–13	–
7	Grass-Likes			27–135	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	27–135	–
	sun sedge	CAINH2	<i>Carex inops ssp. heliophila</i>	0–67	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–67	–
8	Non-Native Grasses			13–67	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	13–67	–
	bluegrass	POA	<i>Poa</i>	0–54	–
Forb					
9	Forbs			67–135	
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	13–67	–
	Forb, introduced	2FI	<i>Forb, introduced</i>	0–40	–
	Forb, native	2FN	<i>Forb, native</i>	0–40	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	13–40	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	13–40	–
	scurfpea	PSORA2	<i>Psoraleidium</i>	13–40	–
	white prairie aster	SYFA	<i>Symphyotrichum falcatum</i>	13–40	–

	woolly plantain	PLPA2	<i>Plantago patagonica</i>	13–27	–
	Missouri goldenrod	SOMI2	<i>Solidago missouriensis</i>	13–27	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	13–27	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–13	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	0–13	–
	prairie clover	DALEA	<i>Dalea</i>	0–13	–
	sanddune wallflower	ERCAC	<i>Erysimum capitatum</i> var. <i>capitatum</i>	0–13	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0–13	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0–13	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0–13	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	0–13	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–13	–
	longbract spiderwort	TRBR	<i>Tradescantia bracteata</i>	0–13	–
Shrub/Vine					
10	Shrubs			67–135	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–67	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	13–67	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	13–54	–
	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	0–27	–
	brittle pricklypear	OPFR	<i>Opuntia fragilis</i>	0–27	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	13–27	–
	rose	ROSA5	<i>Rosa</i>	13–27	–
Moss					
11	Cryptogams			0–40	
	lesser spikemoss	SEDE2	<i>Selaginella densa</i>	0–40	–

Table 10. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Rhizomatous Wheatgrass			0–81	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–81	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus</i> ssp. <i>lanceolatus</i>	0–30	–
2	Mid/Tall Cool-Season Bunchgrasses			0–101	
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	0–101	–
4	Short-Warm Season Grasses			202–353	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	151–303	–
	Fendler threeawn	ARPUL	<i>Aristida purpurea</i> var. <i>longiseta</i>	10–81	–
	saltgrass	DISP	<i>Distichlis spicata</i>	0–50	–
5	Warm-Season Bunchgrasses			10–71	
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	10–71	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–20	–
6	Miscellaneous Native Grasses			20–50	

	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes</i> var. <i>scribnerianum</i>	10–30	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	10–30	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0–20	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	0–10	–
7	Grass-Likes			101–252	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	50–202	–
	sun sedge	CAINH2	<i>Carex inops</i> ssp. <i>heliophila</i>	10–101	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	10–101	–
8	Non-Native Grasses			10–50	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	10–50	–
	bluegrass	POA	<i>Poa</i>	0–40	–
Forb					
9	Forbs			50–121	
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	10–71	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	10–50	–
	Forb, introduced	2FI	<i>Forb, introduced</i>	0–40	–
	Forb, native	2FN	<i>Forb, native</i>	0–30	–
	white prairie aster	SYFA	<i>Symphyotrichum falcatum</i>	10–30	–
	Missouri goldenrod	SOMI2	<i>Solidago missouriensis</i>	10–30	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	10–20	–
	western yarrow	ACMIO	<i>Achillea millefolium</i> var. <i>occidentalis</i>	10–20	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	10–20	–
	scurfpea	PSORA2	<i>Psoralegium</i>	10–20	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0–10	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	0–10	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–10	–
Shrub/Vine					
10	Shrubs			50–101	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	10–71	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–50	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	10–30	–
	brittle pricklypear	OPFR	<i>Opuntia fragilis</i>	0–30	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	10–20	–
	rose	ROSA5	<i>Rosa</i>	10–20	–
	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	0–10	–
Moss					
11	Cryptogams			10–50	
	lesser spikemoss	SEDE2	<i>Selaginella densa</i>	10–50	–

Animal community

Animal Community – Wildlife Interpretations

Major Land Resource Area (MLRA) 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 Sandy 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 Loamy, Shallow Loamy, Shallow Clayey, Thin Loamy, Sandy, Claypan, Sands, Clayey, and Thin Claypan 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 Sandy Claypan ES remains intact and provides increasingly important habitat for grassland and shrub steppe nesting birds, small rodents, coyote, and a variety of reptiles, amphibians, and insects. Invasive species, such as, annual brome grasses 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/Needleandthread/Prairie Sandreed: 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. Grasshopper sparrow, lark bunting, western meadowlark, and sharp-tailed grouse are common and benefit from the structure and composition this plant community provides. Brewer's sparrow and greater sage-grouse may be present depending on the frequency and distribution of big sagebrush. 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 squirrel, white-tailed jackrabbit, and deer. This ES provides excellent wintering habitat for pronghorn. The higher stature of this plant community provides thermal, protective, and escape cover for herbivores and grassland birds. Predators utilizing this plant community include coyote, American badger, red fox, and long-tailed weasel. This plant community provides habitat for herptiles such as the spade foot toad, bull snake, and western rattlesnake.

Needleandthread/Western Wheatgrass/Blue Grama: 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 plant structural diversity provides habitat for a wide array of migratory and resident birds.

Grasshopper sparrow, lark bunting, western meadowlark, and sharp-tailed grouse are common and benefit from the mid- to short structure and composition this plant community provides. This site provides limited nesting and brood rearing habitat for greater sage-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 squirrel, white-tailed jackrabbit, and deer. 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 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/Sedge/Clubmoss: Resulting from heavy, continuous grazing and continuous seasonal grazing, blue grama, sedge, and clubmoss will dominate. The forb diversity has decreased. A shift to short plant structure will favor prairie dog expansion with prairie dog town sites and associate species such as ferruginous hawk and burrowing owl. Species such as horned lark, long-billed curlew, upland sandpiper, and white-tailed jackrabbit will increase due to the loss of big sagebrush. Species such as Brewer's sparrow, greater sage-grouse, as well as, desert cottontail will rarely use this site.

The short stature of this plant community limits suitable thermal, protective, and escape cover. Prey populations are reduced and are more vulnerable to raptor and mammalian predation. Predators utilizing this plant community include the 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 greatly reduce habitat for most amphibian species, grassland birds, and mammals.

Non-disturbed, Go Back, Introduced, and/or Invaded States

This group includes separate vegetation states that are highly variable in nature. They are derived through distinct management scenarios. These plant communities have been or are highly susceptible to invasion of annual brome grasses, bluegrasses, crested wheatgrass, and other nonnative species.

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.

The Go-back state can be reached whenever severe mechanical disturbance (i.e., abandoned farmland) is eliminated. Early successional plant communities include annual and perennial weedy type species first to occupy the site. These sites provide diverse foraging, reproductive, and escape cover favoring multiple edge species. This pioneer plant community provides abundant opportunity for insect, bird, and small mammal foraging due to abundant flowers and seed sources.

The Introduced state provides increased forage and therefore a potential for increased herbivore populations such as deer, pronghorn, and various small mammals. These sites provide diverse foraging, reproductive, and escape cover favoring multiple edge species.

The Invaded state includes areas that have been invaded and are dominated by species such as smooth brome, Kentucky bluegrass, crested wheatgrass, nonnative thistles, field bindweed, knapweeds, leafy spurge, hoary cress, and other introduced species. These sites greatly reduce foraging, reproductive, and escape cover for grassland nesting bird species. Grasshopper populations may increase.

Animal Community – Grazing Interpretations

As this site improves in condition through proper management (from the more shortgrass 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 Go-back and Invaded States are often 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 B. 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 varieties 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; Stan Boltz, RMS, NRCS; Dave Dewald, Wildlife BIO, NRCS; Jody Forman, RMS, NRCS; Dennis Froemke, RMS, NRCS; Cheryl Nielsen, RMS, NRCS; Jeff Printz, RMS, NRCS; Mike Stirling, RMS, NRCS; and Darrell Vanderbusch, Soil Scientist, NRCS.

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.

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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.

2. **Presence of water flow patterns:** None, or barely visible and discontinuous.

3. **Number and height of erosional pedestals or terracettes:** None.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 5 to 25 percent is typical.

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

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

7. **Amount of litter movement (describe size and distance expected to travel):** Litter should fall in place. Slight amount of movement of smallest size class litter is possible, but not normal.

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 5 to 6, normally 6. Surface organic matter adheres to the soil surface. Soil surface fragments will typically retain structure indefinitely when dipped in distilled water.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** A-horizon should be 2 to 5 inches thick with mollic (dark) colors when moist. Structure typically is medium to fine granular at least

in the upper A-horizon.

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 5 to 15 inches with “biscuit-top” appearance at top of pan.
-

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 > Mid/tall cool-season bunchgrasses >

Sub-dominant: Tall warm-season grasses > Forbs = Shrubs >

Other: Short warm-season grasses = Mid warm-season bunchgrasses = Grass-likes

Additional:

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):**
-

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Production ranges from 1,100-2,200 lbs./acre (air-dry weight). Reference value production is 1,600 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
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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.
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