

Ecological site R060AY022SD Loamy Terrace

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General information

Approved. An approved ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model, enough information to identify the ecological site, and full documentation for all ecosystem states contained in the state and transition model.



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.

MLRA notes

Major Land Resource Area (MLRA): 060A–Pierre Shale Plains

MLRA Notes:

The Pierre Shale Plains (MLRA 60A) consists of approximately 10,150 square miles, the majority of which is located in South Dakota (70 percent) and small portions are in Montana (2 percent), Nebraska (8 percent), and Wyoming (20 percent). It encircles the Black Hills (MLRA 62) and the Dakota Hogback (MLRA 61). MLRA 60A includes portions of the Oglala, Buffalo Gap, and Thunder Basin National Grasslands. It also includes small sections of the Pine Ridge Indian Reservation, Badlands National Park, and Black Hills National Forest. The Cheyenne and Belle Fourche Rivers flow through the MLRA.

MLRA 60A is in the unglaciated section of the Missouri Plateau, of the Great Plains Province of the Interior Plains. It is an area of old plateaus and terraces that have been deeply eroded. Cretaceous Pierre Shale underlies almost all of this MLRA. This is a marine sediment with layers of volcanic ash that has been altered to smectitic clay. These clays shrink as they dry and swell as they receive moisture. Soils are shallow to very deep and generally are well drained and clayey.

Elevations generally range from 2,620 to 3,610 feet throughout the MLRA, but can range up to 4,260 feet. The average annual precipitation for the western side of the MLRA is 13 to 16 inches, whereas the eastern side receives 16 to 18 inches. A suite of ecological sites has been written specifically for these two precipitation zones. The Locator Map shows the break between the two precipitation zones.

This area supports a mixed natural prairie vegetation consisting of both cool- and warm-season grasses and forbs. Wyoming big sagebrush occurs primarily in the drier western portion of the MLRA, however, small remnant stands can be found in the eastern portion. Dominant land uses of the area are primarily ranching and, to a lesser extent, farming. Major resource concerns to this MLRA are wind erosion and surface water quality.

Classification relationships

USDA - Land Resource Region G – Western Great Plains Range and Irrigated Region, Major Land Resource Area (MLRA) 60A – Pierre Shale Plains.

EPA - Level IV Ecoregions of the Continental United States: 43e – Sagebrush Steppe, 43g Semiarid Pierre Shale Plains, and 43k – Dense Clay Prairie.

Ecological site concept

The Loamy Terrace ecological site occurs throughout the MLRA. It is located on old, nearly level stream terraces adjacent to overflow and/or lowland sites. This site does not typically receive additional moisture from overflow, however, runoff from adjacent upland sites may provide some additional moisture. Soil surface layer is 5 to 20 inches thick with textures ranging from fine sandy loam to clay loam. This site can have similar vegetative characteristics as the overflow or lowland sites, especially when looking at the woody components. The regeneration of trees is unlikely to occur on the terrace landscape. Vegetation in the Reference State consists of a mix of cool- and warm-season grasses, however, mid-statured, cool-season grasses tend to be the dominant group. Rhizomatous wheatgrass and green needlegrass are the dominant cool-season grasses. Other grasses and grass-like included needle and thread, little bluestem, sideoats grama, blue grama, buffalograss, inland saltgrass, prairie sandreed, and sedges. Forbs are common and diverse. Silver sagebrush is almost always present, western snowberry and leadplant are common. In the western, 13 to 16 inch Precipitation Zone (PZ), greasewood is likely to occur on this site and can increase with heavy disturbance. Remnant trees can include green ash and plains cottonwood, but in minor amounts and little, if any, regeneration.

Associated sites

| | |
|-------------|---|
| R060AY010SD | Loamy 13-16" P.Z. The Loamy 13-16" PZ will be located on upland landscapes adjacent to the terrace landscape. |
| R060AY020SD | Loamy Overflow The Loamy Overflow will be located lower in the landscape and within the floodplain. |
| R060AY041SD | Loamy 16-18" P.Z. The Loamy 16-18" PZ will be located on upland landscapes adjacent to the terrace landscape. |

Similar sites

| | |
|-------------|---|
| R060AY041SD | Loamy 16-18" P.Z. The Loamy 16-18" PZ will have few if any shrubs and lower production. |
| R060AY010SD | Loamy 13-16" P.Z. The loamy 13-16" PZ will have less shrubs and lower production. |

Table 1. Dominant plant species

| | |
|------------|---|
| Tree | Not specified |
| Shrub | (1) <i>Artemisia cana</i> |
| Herbaceous | (1) <i>Pascopyrum smithii</i> (2) <i>Nassella viridula</i> |

Physiographic features

This site occurs on nearly level to gently sloping terraces, valleys, and uplands.

Table 2. Representative physiographic features

| | |
|--------------------|--|
| Landforms | (1) Alluvial fan (2) Terrace (3) Plain |
| Flooding duration | Very brief (4 to 48 hours) |
| Flooding frequency | None to very rare |
| Ponding frequency | None |
| Elevation | 2,500–4,300 ft |
| Slope | 0–6% |
| Water table depth | 42–80 in |
| 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 steppes to the east. Annual precipitation for the entire MLRA ranges from 13 to 18 inches per year, with most occurring during the growing season. 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. Cold air masses from Canada in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Chinook winds may occur in winter and bring rapid rises in temperature. Extreme storms may occur during the winter, but the more severe occur during late fall, late winter, and spring. The normal average annual temperature is about 46°F. January is the coldest month with average temperatures ranging from about 19°F (Moorcroft CAA, WY) to about 22°F (Belle Fourche, SD). July is the warmest month with temperatures averaging from about 70°F (Moorcroft CAA, WY) to about 72°F (Belle Fourche, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 51°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 generally are 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) | 115 days |
| Freeze-free period (average) | 133 days |
| Precipitation total (average) | 17 in |

Climate stations used

- (1) ARDMORE 1 NW [USC00390236], Edgemont, SD
- (2) BELLE FOURCHE [USC00390559], Belle Fourche, SD
- (3) WASTA [USC00398911], Owanka, SD
- (4) REDBIRD [USC00487555], Lance Creek, WY
- (5) MOORCROFT 3S [USW00024088], Moorcroft, WY
- (6) UPTON [USC00489205], Upton, WY

Influencing water features

Stream Type: B6, C6
(Rosgen System)

Soil features

The soils in this site are moderately well to well drained and formed in alluvium. The clay loam to fine sandy loam surface layer is 5 to 20 inches thick. The soils have a moderately slow to moderately rapid infiltration rate. This site should show no evidence of rills, wind-scoured areas, or pedestalled plants. Water flow patterns are broken, irregular in appearance, or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact.

Soils correlated to the Loamy Terrace site: Bridgeport, Colombo, Owanka, and Swint.

Other soils that have multiple ecological site correlations including Loamy Terrace: Craft, Glenberg, Haverson, Lohmiller, and Rocky Point.

These soils are mainly susceptible to water erosion, but sandy textured surface soils are susceptible to wind erosion. The hazard of water erosion increases where vegetative cover is not adequate. A drastic loss of the soil surface layer on this site can result in a shift in species composition and/or production. More information can be found in the various soil survey reports. Contact the local USDA Service Center for soil survey reports that include more detail specific to your location.

Table 4. Representative soil features

| | |
|--|---|
| Surface texture | (1) Sandy loam (2) Loam (3) Clay loam |
| Family particle size | (1) Loamy |
| Drainage class | Moderately well drained to well drained |
| Permeability class | Moderately slow to moderate |
| Soil depth | 80 in |
| Surface fragment cover <=3" | 0% |
| Surface fragment cover >3" | 0% |
| Available water capacity (0-40in) | 6-7 in |
| Calcium carbonate equivalent (0-40in) | 3-15% |
| Electrical conductivity (0-40in) | 0-4 mmhos/cm |
| Sodium adsorption ratio (0-40in) | 0-2 |
| Soil reaction (1:1 water) (0-40in) | 6.1-8.4 |
| Subsurface fragment volume <=3" (Depth not specified) | 0-10% |
| Subsurface fragment volume >3" (Depth not specified) | 0-5% |

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 specify 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.

A high percentage of these areas have been tilled in the past, and have been planted to alfalfa for haying or are in a cropping system. They are also located in good winter livestock areas and are used as calving/feeding areas. Very few areas exist that have not had heavy soil disturbance.

Continuous, season-long grazing (during the typical growing season of May through October) and/or heavy, continuous grazing (e.g., every spring and/or every summer at moderate to heavy stocking levels) without adequate recovery periods following grazing events causes the departure from the Western Wheatgrass-Green Needlegrass/Shrubs Community Phase (1.1). Short grasses and grass-like species such as sedge, blue grama, and bluegrass will increase and eventually develop into a sod. Western wheatgrass will increase initially and then begin to decrease. Green needlegrass and sideoats grama will decrease in frequency and production. Extended periods of non-use and lack of fire will result in excessive litter and a plant community dominated by cool-season grasses such as western wheatgrass, green needlegrass, Kentucky bluegrass, and smooth brome. Remnant mature trees are randomly present across this site, but regeneration does not typically occur.

Interpretations are primarily based on the Reference Plant Community Phase (1.1). The Reference Plant Community Phase has been determined by study of 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 community phases, 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

Loamy Terrace – R060AY022SD 6/12/17

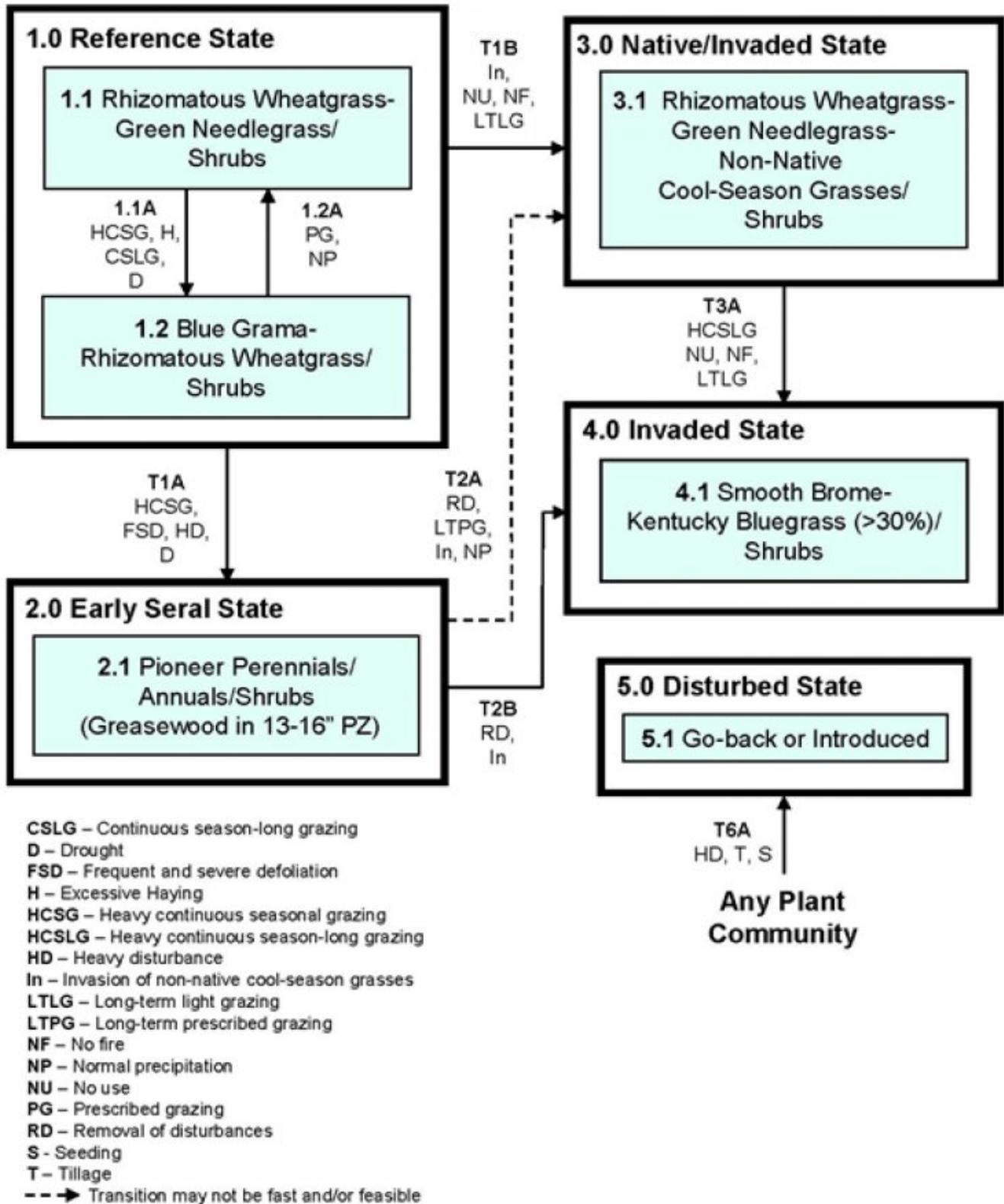


Figure 6. Loamy Terrace - R060AY022SD

| Diagram Legend - Loamy Terrace - R060AY022SD | | |
|--|--|---|
| T1A | Heavy continuous seasonal grazing, frequent and severe defoliation, heavy disturbance or grazing in combination with drought. | |
| T1B | Invasion of non-native cool-season grasses, no use, no fire, or long-term light grazing. | |
| T2A | Removal of grazing disturbance, long-term prescribed grazing, invasion and establishment of non-native cool-season grasses, return to normal precipitation patterns. | |
| T2B | Removal of grazing disturbance and invasion and establishment of non-native cool-season grasses. | |
| T3A | Heavy continuous season-long grazing, no use and no fire or long-term light grazing. | |
| T6A | Heavy disturbance such as tillage, abandoned cropland or tillage, and seeding to introduced perennial forage crops. | |
| CP 1.1A | 1.1 - 1.2 | Heavy, continuous seasonal grazing (spring or winter) or continuous seasonal grazing, without adequate recovery, grazing in combination with drought or excessive haying. |
| CP 1.2A | 1.2 - 1.1 | Prescribed grazing with proper stocking, change in season of use and adequate recovery, normal precipitation following drought. |

Figure 7. Loamy Terrace - R060AY022SD

State 1 Reference State

This state represents what is believed to show the natural range of variability that dominated the dynamics in this ecological site prior to European settlement. This site is dominated by cool- and warm-season grasses. In pre-European times the primary disturbances included fire and grazing by large ungulates, small mammals, and insects. Favorable growing conditions occurred during the spring and the warm months of June through August. This State can be found on areas with a history of proper grazing management, including adequate recovery periods between grazing events.

Community 1.1 Rhizomatous Wheatgrass-Green Needlegrass/Shrubs



Figure 8. Plant Community Phase 1.1.



Figure 9. Plant Community Phase 1.1.

The plant community upon which interpretations are primarily based is the Rhizomatous Wheatgrass-Green Needlegrass/Shrubs Plant Community (1.1). This is also considered to be the Reference Plant Community. This plant community can be found on areas that are properly managed with prescribed grazing. The potential vegetation is about 75 to 85 percent grasses and grass-like plants, 5 to 10 percent forbs, 10 to 15 percent shrubs, and 0 to 2 percent trees. Major grasses include rhizomatous wheatgrasses and green needlegrass. Other grasses occurring on this community include prairie sandreed, needle and thread, blue grama, and sideoats grama. Major forbs include American vetch, purple prairie clover, cudweed sagewort, western yarrow, and sunflower. Major shrubs include silver sagebrush, western snowberry, chokecherry, and fringed sagewort. In the western portion of the MLRA (13 to 16 inch PZ), greasewood and Wyoming big sagebrush will occur in minor amounts. Scattered green ash and plains cottonwood may occur. 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 properly. Plant litter is properly distributed with very little movement off-site, and natural plant mortality is very low. The diversity in plant species allows for high drought tolerance. Run-off from adjacent sites and moderate or high available water capacity provides a favorable soil-water-plant relationship.

Table 5. Annual production by plant type

| Plant Type | Low (Lb/Acre) | Representative Value (Lb/Acre) | High (Lb/Acre) |
|-----------------|---------------|--------------------------------|----------------|
| Grass/Grasslike | 1360 | 1975 | 2570 |
| Shrub/Vine | 220 | 312 | 400 |
| Forb | 120 | 188 | 275 |
| Tree | 0 | 25 | 55 |
| Total | 1700 | 2500 | 3300 |

Figure 11. Plant community growth curve (percent production by month). SD6002, Pierre Shale Plains, cool-season dominant, warm-season sub-dominant.. Cool-season dominant, warm-season sub-dominant..

| 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-Rhizomatous Wheatgrass/Shrubs

This plant community can slowly develop from the adverse effects of continuous grazing without adequate recovery periods between each grazing event during the growing season, or change in season of use. Excessive haying will also cause this plant community shift. Recognition of this plant community will enable the land user to implement key management decisions before a significant ecological threshold is crossed. Blue grama and rhizomatous wheatgrasses are the dominant species. Green needlegrass has been greatly reduced. Forb species include western yarrow, asters, prairie coneflower, silverleaf scurfpea, wavyleaf thistle, and western salsify. Chokecherry

and plum are greatly reduced while other shrub species could show evidence of heavy browsing. In the western portion of the MLRA (13 to 16 inch PZ), greasewood will tend to increase in this plant community. This plant community is relatively stable and less productive than the Reference Plant Community (1.1). Reduction of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, increased runoff, and high evapotranspiration rates. This plant community can occur throughout the site, on spot-grazed areas, and around water sources where season-long grazing patterns occur. Soil erosion will be minimal due to the sod forming habit of blue grama.

Table 6. Annual production by plant type

| Plant Type | Low (Lb/Acre) | Representative Value (Lb/Acre) | High (Lb/Acre) |
|-----------------|---------------|--------------------------------|----------------|
| Grass/Grasslike | 430 | 672 | 1210 |
| Shrub/Vine | 35 | 60 | 85 |
| Forb | 35 | 60 | 85 |
| Tree | 0 | 8 | 20 |
| Total | 500 | 800 | 1400 |

Figure 13. Plant community growth curve (percent production by month). SD6003, Pierre Shale Plains, cool-season/warm-season co-dominant.. Cool-season, warm-season co-dominant.

| 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

Heavy, continuous seasonal (i.e. spring) grazing, continuous season-long grazing, excessive haying in combination with drought will convert this Plant Community Phase (PCP) to the Blue Grama-Rhizomatous Wheatgrass/Shrubs Plant Community (1.2).

Pathway 1.2A Community 1.2 to 1.1

Prescribed grazing with adequate recovery periods following each grazing event and proper stocking will shift this plant community back to the Rhizomatous Wheatgrass-Green Needlegrass/Shrubs (1.1). A return to normal precipitation patterns will aid in this community shift.

State 2 Early Seral State

This state is the result of heavy, concentrated disturbance such as rodent activity, or heavy use areas by livestock. This State can also develop as a result of invasion by highly competitive weed species such as Canada thistle, hound's tongue, leafy spurge, or knapweeds. Extended periods of drought accompanied by heavy grazing can also push an 'At Risk' plant community phase to this State. In most cases, this phase is dominated by pioneer perennial and annual grasses, and forb species. Bare ground is also much higher than on any other plant community phase. In the western portion of this MLRA (13 to 16 inch PZ), greasewood is likely to increase significantly if it is located on adjacent sites.

Community 2.1 Pioneer Perennials/Annuals/Shrubs

This plant community develops under severe disturbance, heavy continuous grazing, and/or excessive defoliation. This can result from heavy livestock or wildlife concentration. The dominant vegetation includes pioneer annual grasses, forbs, invaders, and early successional biennial and perennial species. Grasses may include sixweeks fescue, smooth brome, annual brome, blue grama, needle and thread, prairie Junegrass, and western

wheatgrass. The dominant forbs may include curlycup gumweed, lambsquarter, salsify, kochia, field bindweed, thistles, western ragweed, and other early successional species. Shrubs that may be present include prairie rose, fringed sagewort, and greasewood. Plant species from adjacent ecological sites may become minor components of this plant community. The community is susceptible to invasion of other non-native species due to the severe soil disturbances and the relatively high percentage of bare ground. This plant community is resistant to change, as long as soil disturbance or severe vegetation defoliation persists, thus holding back secondary plant succession. Soil erosion is potentially high. Reduced surface cover, low plant density, low plant vigor, loss of root biomass, and soil compaction, all contribute to decreased water infiltration, increased runoff, and accelerated erosion rates. Significant economic inputs, management, and time would be required to move this plant community toward a higher successional stage and a more productive plant community. Secondary succession is highly variable, depending upon availability and diversity of a viable seed bank of higher successional species within the existing plant community and neighboring plant communities. This plant community can be mechanically renovated and seeded to improve the production capability, but management changes would be needed in order to maintain the new plant community.

Figure 14. Plant community growth curve (percent production by month). SD6001, Pierre Shale Plains, cool-season dominant. Cool-season dominant..

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 0 | 4 | 12 | 25 | 36 | 10 | 5 | 4 | 4 | 0 | 0 |

State 3 Native/Invaded State

This State has been invaded by Kentucky bluegrass and/or smooth brome, but not at the levels where the plant community is dominated by these species. The plant community in this State looks very similar to the Reference Plant Community (1.1) and it functions very much like the Reference State. It is 'At Risk' of transitioning to the Invaded State (4.0) which is dominated by smooth brome and/or Kentucky bluegrass.

Community 3.1 Rhizomatous Wheatgrass-Green Needlegrass-Non-Native Cool-Season Grasses/Shrubs

This plant community develops when Kentucky bluegrass and/or smooth brome invade and become established on the site. This is due to the close proximity to seed sources or expansion from road ditches, improved pastures, or other invaded sites. No use and no fire, or very light stock stocking rates for long periods of time, will allow these non-native, cool-season grasses to increase in the plant community. With non-use, plant litter accumulates in large amounts when this community first develops. Litter buildup reduces mature native plant vigor and density, and seedling recruitment declines. Eventually litter levels become high enough that plant density decreases. Typically, rhizomatous grasses form small colonies because of a lack of tiller stimulation. The potential vegetation is 75 to 90 percent grasses or grass-like plants, 5 to 10 percent forbs, 5 to 15 percent shrubs, and 0 to 3 percent trees. The dominant grasses will be rhizomatous wheatgrass, green needlegrass, and non-native cool-season grasses, primarily, smooth brome and/or Kentucky bluegrass. Forbs will be diverse but not dominate. Shrubs and trees will occur in similar amounts as in Plant Community Phase (1.1).

Table 7. Annual production by plant type

| Plant Type | Low (Lb/Acre) | Representative Value (Lb/Acre) | High (Lb/Acre) |
|-----------------|---------------|--------------------------------|----------------|
| Grass/Grasslike | 1075 | 1448 | 1955 |
| Shrub/Vine | 220 | 368 | 450 |
| Forb | 205 | 263 | 350 |
| Tree | 0 | 21 | 45 |
| Total | 1500 | 2100 | 2800 |

Figure 16. Plant community growth curve (percent production by month). SD6002, Pierre Shale Plains, cool-season dominant, warm-season sub-dominant.. Cool-season dominant, warm-season sub-dominant..

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

State 4 Invaded State

This state is the result of invasion of introduced cool-season grass species. This state is characterized by the dominance of Kentucky bluegrass and smooth brome, and an increasing thatch layer that effectively blocks introduction of other plants into the system. Plant litter accumulation tends to favor the more shade-tolerant introduced grass species. The nutrient cycle is also impaired, the result is typically a higher level of nitrogen, which also favors the introduced species. Increasing plant litter decreases the amount of sunlight reaching plant crowns, thereby shifting competitive advantage to shade-tolerant, introduced grass species. Studies indicate that soil biological activity is altered, and this shift apparently exploits the soil microclimate and encourages growth of the introduced grass species. Once the threshold is crossed, a change in grazing management alone cannot cause a reduction in the invasive grass dominance. Preliminary studies would tend to indicate this threshold may exist when Kentucky bluegrass exceeds 30 to 35 percent of the plant community and native grasses represent less than 40 percent of the plant community composition. Plant communities dominated by Kentucky bluegrass have significantly less cover and diversity of native grasses and forb species (Toledo, D. et al., 2014).

Community 4.1 Smooth Brome-Kentucky Bluegrass/Shrub

This plant community develops after an extended period of non-use and exclusion of fire. Eventually litter levels become high enough to reduce native grass vigor, diversity and density. Kentucky bluegrass dominates this plant community. Common forbs include sweetclover, cudweed sagewort, and goldenrod species. Shrubs such as western snowberry and/or silver sagebrush, along with remnant trees will persist in the plant community. This plant community is resistant to change without prescribed grazing and/or fire. The combination of both grazing and fire is most effective in moving this plant community toward the Reference State (1.0). Soil erosion is low. Runoff will typically be greater than in the Reference State. Once the advanced stage of this plant community is reached, time and external resources will be needed to see a recovery in the diversity of the site.

State 5 Disturbed State

Any plant community can transition to this State. The two Plant Communities, Go-Back and Introduced, are highly variable in nature. They are derived through different management scenarios, and are not related successionaly. Infiltration, runoff, and soil erosion vary depending on the vegetation present on the site.

Community 5.1 Go-back or Introduced

The Go-back Plant Community can be reached whenever a severe mechanical disturbance occurs (e.g., tilled and abandoned land, either past or present). 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 dominated by threeawn, bluegrass, smooth brome, annual brome grass, crested wheatgrass, buffalograss, broom snakeweed, sweetclover, and nonnative thistles. Other plants that commonly occur on the site include western wheatgrass, deathcamas, prickly lettuce, mares-tail, kochia, foxtail, and sunflowers. Bare ground is prevalent due to the loss of organic matter and lower overall soil health. The Introduced Plant Community is normally those areas seeded to pubescent or intermediate wheatgrass, alfalfa, crested wheatgrass, or other introduced species. Refer to the associated Forage Suitability Group description for adapted species.

Transition T1A State 1 to 2

Heavy, continuous seasonal grazing (i.e. early spring grazing), frequent and severe defoliation, heavy disturbance,

combined with drought will transition this state to the Early Seral State (2.0).

Transition T1B **State 1 to 3**

Non-use and lack of fire for extended periods of time, long-term light grazing, and invasion of non-native cool-season grasses, will transition the Reference State to the Native/Invaded State (3.0).

Transition T6A **State 1 to 5**

Heavy disturbance including tillage, abandonment of cropland, or seeding to improved pasture species result in a transition to the Disturbed State (5.0).

Transition T2A **State 2 to 3**

If the disturbance causing severe defoliation is removed and long-term prescribed grazing is initiated, including adequate rest periods, and normal precipitation patterns return, this plant community may transition to the Native/Invaded State (3.0). With the presence of non-native, cool-season grasses in local plant communities, it is assumed the Early Seral State will be invaded, to a certain extent, by non-native cool-season grasses. Therefore, a restoration pathway to the Reference State (1.0) is unlikely. This pathway will take an extended period of time and may not in the end meet management objectives.

Transition T2B **State 2 to 4**

If the disturbance causing the severe defoliation is removed and the plant community is invaded by non-native, cool-season grasses, this plant community is likely to transition to the Invaded State (4.0).

Transition T6A **State 2 to 5**

Heavy disturbance including tillage, abandonment of cropland, or seeding to improved pasture species result in a transition to the Disturbed State (5.0).

Transition T3A **State 3 to 4**

Heavy, continuous season-long grazing, or no use and no fire, or long-term light grazing will cause a transition of the Native/Invaded State to the Invaded State (4.0). The ecological threshold can be identified by the percentage of non-native cool-season species in the plant community. Preliminary studies would tend to indicate this threshold may exist when Kentucky bluegrass exceeds 30 to 35 percent of the plant community and native grasses represent less than 40 percent of the plant community composition (Toledo, D. et al., 2014). Smooth brome is assumed to follow a similar ecological threshold, but is not documented scientifically.

Transition T6A **State 3 to 5**

Heavy disturbance including tillage, abandonment of cropland, or seeding to improved pasture species result in a transition to the Disturbed State (5.0).

Transition T6A **State 4 to 5**

Heavy disturbance including tillage, abandonment of cropland, or seeding to improved pasture species result in a transition to the Disturbed State (5.0).

Additional community tables

Table 8. Community 1.1 plant community composition

| Group | Common Name | Symbol | Scientific Name | Annual Production (Lb/Acre) | Foliar Cover (%) |
|------------------------|-----------------------------------|--------|--|-----------------------------|------------------|
| Grass/Grasslike | | | | | |
| 1 | Western Wheatgrass | | | 625–1000 | |
| | western wheatgrass | PASM | <i>Pascopyrum smithii</i> | 625–1000 | – |
| 2 | Needlegrass | | | 500–750 | |
| | green needlegrass | NAVI4 | <i>Nassella viridula</i> | 375–500 | – |
| | needle and thread | HECOC8 | <i>Hesperostipa comata ssp. comata</i> | 125–250 | – |
| 3 | Short Warm-Season Grasses | | | 125–250 | |
| | blue grama | BOGR2 | <i>Bouteloua gracilis</i> | 125–250 | – |
| | buffalograss | BODA2 | <i>Bouteloua dactyloides</i> | 25–100 | – |
| 4 | Other Warm- Season Grasses | | | 50–375 | |
| | big bluestem | ANGE | <i>Andropogon gerardii</i> | 25–200 | – |
| | sideoats grama | BOCU | <i>Bouteloua curtipendula</i> | 25–200 | – |
| | switchgrass | PAVI2 | <i>Panicum virgatum</i> | 25–125 | – |
| 5 | Other Native Grasses | | | 125–375 | |
| | prairie sandreed | CALO | <i>Calamovilfa longifolia</i> | 125–375 | – |
| | prairie dropseed | SPHE | <i>Sporobolus heterolepis</i> | 50–125 | – |
| | prairie Junegrass | KOMA | <i>Koeleria macrantha</i> | 25–75 | – |
| | Grass, perennial | 2GP | <i>Grass, perennial</i> | 25–75 | – |
| | saltgrass | DISP | <i>Distichlis spicata</i> | 0–25 | – |
| | Canada wildrye | ELCA4 | <i>Elymus canadensis</i> | 0–25 | – |
| 6 | Grass-Likes | | | 125–250 | |
| | sedge | CAREX | <i>Carex</i> | 125–250 | – |
| | Grass-like (not a true grass) | 2GL | <i>Grass-like (not a true grass)</i> | 0–25 | – |
| Forb | | | | | |
| 8 | Forbs | | | 125–250 | |
| | white heath aster | SYER | <i>Symphotrichum ericoides</i> | 25–125 | – |
| | white sagebrush | ARLU | <i>Artemisia ludoviciana</i> | 25–125 | – |
| | mint | MENTH | <i>Mentha</i> | 25–125 | – |
| | Maximilian sunflower | HEMA2 | <i>Helianthus maximiliani</i> | 25–125 | – |
| | scurfpea | PSORA2 | <i>Psoralea</i> | 0–50 | – |
| | common yarrow | ACMI2 | <i>Achillea millefolium</i> | 25–50 | – |
| | purple prairie clover | DAPU5 | <i>Dalea purpurea</i> | 25–50 | – |
| | American vetch | VIAM | <i>Vicia americana</i> | 25–50 | – |
| | goldenrod | SOLID | <i>Solidago</i> | 25–50 | – |
| | scarlet globemallow | SPCO | <i>Sphaeralcea coccinea</i> | 0–25 | – |
| | Forb, perennial | 2FP | <i>Forb, perennial</i> | 0–25 | – |
| | larkspur | DELPH | <i>Delphinium</i> | 0–25 | – |
| | blacksamson echinacea | ECAN2 | <i>Echinacea angustifolia</i> | 0–25 | – |
| | sanddune wallflower | ERCAC | <i>Erysimum canitatum var.</i> | 0–25 | – |

| | | | | | |
|--|-----------------------------|-------|---------------------------------|------|---|
| | | | <i>capitatum</i> | | |
| | onion | ALLIU | <i>Allium</i> | 0–25 | – |
| | tarragon | ARDR4 | <i>Artemisia dracunculus</i> | 0–25 | – |
| | groundplum milkvetch | ASCR2 | <i>Astragalus crassicaarpus</i> | 0–25 | – |
| | wavyleaf thistle | CIUN | <i>Cirsium undulatum</i> | 0–25 | – |
| | upright prairie coneflower | RACO3 | <i>Ratibida columnifera</i> | 0–25 | – |
| | dotted blazing star | LIPU | <i>Liatris punctata</i> | 0–25 | – |
| | rush skeletonplant | LYJU | <i>Lygodesmia juncea</i> | 0–25 | – |
| | bluebells | MERTE | <i>Mertensia</i> | 0–25 | – |
| | scarlet beeblossom | OESU3 | <i>Oenothera suffrutescens</i> | 0–25 | – |
| | silverleaf Indian breadroot | PEAR6 | <i>Pediomelum argophyllum</i> | 0–25 | – |

Shrub/Vine

| | | | | | |
|---|---------------------|--------|------------------------------------|---------|---|
| 9 | Shrubs | | | 250–375 | |
| | silver sagebrush | ARCA13 | <i>Artemisia cana</i> | 25–250 | – |
| | western snowberry | SYOC | <i>Symphoricarpos occidentalis</i> | 25–250 | – |
| | rose | ROSA5 | <i>Rosa</i> | 25–75 | – |
| | prairie sagewort | ARFR4 | <i>Artemisia frigida</i> | 25–75 | – |
| | big sagebrush | ARTR2 | <i>Artemisia tridentata</i> | 0–75 | – |
| | winterfat | KRLA2 | <i>Krascheninnikovia lanata</i> | 0–50 | – |
| | American plum | PRAM | <i>Prunus americana</i> | 25–50 | – |
| | chokecherry | PRVI | <i>Prunus virginiana</i> | 25–50 | – |
| | greasewood | SAVE4 | <i>Sarcobatus vermiculatus</i> | 0–50 | – |
| | leadplant | AMCA6 | <i>Amorpha canescens</i> | 0–50 | – |
| | silver buffaloberry | SHAR | <i>Shepherdia argentea</i> | 0–25 | – |
| | currant | RIBES | <i>Ribes</i> | 0–25 | – |
| | Subshrub (<.5m) | 2SUBS | <i>Subshrub (<.5m)</i> | 0–25 | – |

Tree

| | | | | | |
|----|-------------------|-------|--|------|---|
| 10 | Trees | | | 0–50 | |
| | boxelder | ACNE2 | <i>Acer negundo</i> | 0–25 | – |
| | green ash | FRPE | <i>Fraxinus pennsylvanica</i> | 0–25 | – |
| | plains cottonwood | PODEM | <i>Populus deltoides ssp. monilifera</i> | 0–25 | – |
| | American elm | ULAM | <i>Ulmus americana</i> | 0–25 | – |

Table 9. Community 1.2 plant community composition

| Group | Common Name | Symbol | Scientific Name | Annual Production (Lb/Acre) | Foliar Cover (%) |
|------------------------|----------------------------------|--------|--|-----------------------------|------------------|
| Grass/Grasslike | | | | | |
| 1 | Western Wheatgrass | | | 240–360 | |
| | western wheatgrass | PASM | <i>Pascopyrum smithii</i> | 240–360 | – |
| 2 | Needlegrass | | | 16–40 | |
| | green needlegrass | NAVI4 | <i>Nassella viridula</i> | 16–40 | – |
| | needle and thread | HECOC8 | <i>Hesperostipa comata ssp. comata</i> | 8–24 | – |
| 3 | Short Warm-Season Grasses | | | 120–400 | |
| | blue grama | BOGR2 | <i>Bouteloua gracilis</i> | 120–350 | – |

| | | | | | |
|-------------------|----------------------------------|--------|--|--------|---|
| | buffalograss | BODAZ | <i>Bouteloua dactyloides</i> | 25–100 | – |
| 4 | Other Warm-Season Grasses | | | 8–40 | |
| | sideoats grama | BOCU | <i>Bouteloua curtipendula</i> | 8–40 | – |
| | switchgrass | PAVI2 | <i>Panicum virgatum</i> | 0–16 | – |
| | big bluestem | ANGE | <i>Andropogon gerardii</i> | 0–16 | – |
| 5 | Other Native Grasses | | | 40–120 | |
| | sand dropseed | SPCR | <i>Sporobolus cryptandrus</i> | 16–80 | – |
| | Grass, perennial | 2GP | <i>Grass, perennial</i> | 16–40 | – |
| | prairie sandreed | CALO | <i>Calamovilfa longifolia</i> | 16–40 | – |
| | saltgrass | DISP | <i>Distichlis spicata</i> | 0–40 | – |
| | prairie Junegrass | KOMA | <i>Koeleria macrantha</i> | 8–40 | – |
| | prairie dropseed | SPHE | <i>Sporobolus heterolepis</i> | 0–8 | – |
| 6 | Grass-Likes | | | 80–120 | |
| | Kentucky bluegrass | POPR | <i>Poa pratensis</i> | 0–80 | – |
| | cheatgrass | BRTE | <i>Bromus tectorum</i> | 8–40 | – |
| Forb | | | | | |
| 8 | Forbs | | | 40–80 | |
| | white heath aster | SYER | <i>Symphotrichum ericoides</i> | 16–40 | – |
| | white sagebrush | ARLU | <i>Artemisia ludoviciana</i> | 8–40 | – |
| | scurfpea | PSORA2 | <i>Psoraleidium</i> | 16–40 | – |
| | upright prairie coneflower | RACO3 | <i>Ratibida columnifera</i> | 8–40 | – |
| | tarragon | ARDR4 | <i>Artemisia dracunculus</i> | 8–24 | – |
| | Forb, perennial | 2FP | <i>Forb, perennial</i> | 8–24 | – |
| | common yarrow | ACMI2 | <i>Achillea millefolium</i> | 8–24 | – |
| | groundplum milkvetch | ASCR2 | <i>Astragalus crassicaarpus</i> | 8–24 | – |
| | larkspur | DELPH | <i>Delphinium</i> | 8–24 | – |
| | scarlet globemallow | SPCO | <i>Sphaeralcea coccinea</i> | 8–24 | – |
| | wavyleaf thistle | CIUN | <i>Cirsium undulatum</i> | 8–16 | – |
| | rush skeletonplant | LYJU | <i>Lygodesmia juncea</i> | 0–16 | – |
| | silverleaf Indian breadroot | PEAR6 | <i>Pediomelum argophyllum</i> | 8–16 | – |
| | goldenrod | SOLID | <i>Solidago</i> | 0–16 | – |
| | yellow salsify | TRDU | <i>Tragopogon dubius</i> | 8–16 | – |
| | American vetch | VIAM | <i>Vicia americana</i> | 0–16 | – |
| | scarlet beeblossom | OESU3 | <i>Oenothera suffrutescens</i> | 0–8 | – |
| | onion | ALLIU | <i>Allium</i> | 0–8 | – |
| | purple prairie clover | DAPU5 | <i>Dalea purpurea</i> | 0–8 | – |
| | blacksamson echinacea | ECAN2 | <i>Echinacea angustifolia</i> | 0–8 | – |
| | sanddune wallflower | ERCAC | <i>Erysimum capitatum var. capitatum</i> | 0–8 | – |
| | dotted blazing star | LIPU | <i>Liatris punctata</i> | 0–8 | – |
| Shrub/Vine | | | | | |
| 9 | Shrubs | | | 40–80 | |
| | silver sagebrush | ARCA13 | <i>Artemisia cana</i> | 8–40 | – |
| | prairie saqwort | ARFR4 | <i>Artemisia frigida</i> | 16–40 | – |

| | | | | | |
|-------------|---------------------|-------|--|------|---|
| | western snowberry | SYOC | <i>Symphoricarpos occidentalis</i> | 8–40 | – |
| | greasewood | SAVE4 | <i>Sarcobatus vermiculatus</i> | 0–40 | – |
| | rose | ROSA5 | <i>Rosa</i> | 8–24 | – |
| | big sagebrush | ARTR2 | <i>Artemisia tridentata</i> | 0–24 | – |
| | broom snakeweed | GUSA2 | <i>Gutierrezia sarothrae</i> | 0–24 | – |
| | American plum | PRAM | <i>Prunus americana</i> | 0–16 | – |
| | chokecherry | PRVI | <i>Prunus virginiana</i> | 0–16 | – |
| | currant | RIBES | <i>Ribes</i> | 0–8 | – |
| | silver buffaloberry | SHAR | <i>Shepherdia argentea</i> | 0–8 | – |
| Tree | | | | | |
| 10 | Trees | | | 0–16 | |
| | Tree | 2TREE | <i>Tree</i> | 0–8 | – |
| | boxelder | ACNE2 | <i>Acer negundo</i> | 0–8 | – |
| | green ash | FRPE | <i>Fraxinus pennsylvanica</i> | 0–8 | – |
| | plains cottonwood | PODEM | <i>Populus deltoides ssp. monilifera</i> | 0–8 | – |
| | American elm | ULAM | <i>Ulmus americana</i> | 0–8 | – |

Table 10. Community 3.1 plant community composition

| Group | Common Name | Symbol | Scientific Name | Annual Production (Lb/Acre) | Foliar Cover (%) |
|------------------------|----------------------------------|--------|--|-----------------------------|------------------|
| Grass/Grasslike | | | | | |
| 1 | Western Wheatgrass | | | 300–800 | |
| | western wheatgrass | PASM | <i>Pascopyrum smithii</i> | 300–800 | – |
| 2 | Needlegrass | | | 42–315 | |
| | green needlegrass | NAVI4 | <i>Nassella viridula</i> | 21–210 | – |
| | needle and thread | HECOC8 | <i>Hesperostipa comata ssp. comata</i> | 21–105 | – |
| 3 | Short Warm-Season Grasses | | | 105–210 | |
| | blue grama | BOGR2 | <i>Bouteloua gracilis</i> | 105–210 | – |
| | buffalograss | BODA2 | <i>Bouteloua dactyloides</i> | 25–100 | – |
| 4 | Other Warm-Season Grasses | | | 21–105 | |
| | switchgrass | PAVI2 | <i>Panicum virgatum</i> | 21–105 | – |
| | big bluestem | ANGE | <i>Andropogon gerardii</i> | 21–63 | – |
| | sideoats grama | BOCU | <i>Bouteloua curtipendula</i> | 0–63 | – |
| 5 | Other Native Grasses | | | 105–315 | |
| | prairie sandreed | CALO | <i>Calamovilfa longifolia</i> | 42–168 | – |
| | Grass, perennial | 2GP | <i>Grass, perennial</i> | 42–105 | – |
| | sand dropseed | SPCR | <i>Sporobolus cryptandrus</i> | 21–105 | – |
| | prairie dropseed | SPHE | <i>Sporobolus heterolepis</i> | 0–105 | – |
| | Canada wildrye | ELCA4 | <i>Elymus canadensis</i> | 0–63 | – |
| | prairie Junegrass | KOMA | <i>Koeleria macrantha</i> | 0–63 | – |
| | saltgrass | DISP | <i>Distichlis spicata</i> | 0–42 | – |
| 6 | Grass-Likes | | | 105–210 | |
| | sedge | CAREX | <i>Carex</i> | 105–210 | – |
| | Grass-like (not a true grass) | 2GL | <i>Grass-like (not a true grass)</i> | 0–42 | – |

| | | | | | |
|-------------------|-----------------------------|--------|--|---------|---|
| | grass) | | | | |
| 7 | Non-Native Grasses | | | 75–250 | |
| | Kentucky bluegrass | POPR | <i>Poa pratensis</i> | 75–200 | – |
| | cheatgrass | BRTE | <i>Bromus tectorum</i> | 42–150 | – |
| | smooth brome | BRIN2 | <i>Bromus inermis</i> | 0–105 | – |
| Forb | | | | | |
| 8 | Forbs | | | 210–315 | |
| | white heath aster | SYER | <i>Symphotrichum ericoides</i> | 42–105 | – |
| | silverleaf Indian breadroot | PEAR6 | <i>Pediomelum argophyllum</i> | 21–105 | – |
| | scurfpea | PSORA2 | <i>Psoraleidium</i> | 21–105 | – |
| | goldenrod | SOLID | <i>Solidago</i> | 21–105 | – |
| | Forb, perennial | 2FP | <i>Forb, perennial</i> | 42–105 | – |
| | white sagebrush | ARLU | <i>Artemisia ludoviciana</i> | 21–105 | – |
| | larkspur | DELPH | <i>Delphinium</i> | 42–105 | – |
| | dotted blazing star | LIPU | <i>Liatris punctata</i> | 21–105 | – |
| | tarragon | ARDR4 | <i>Artemisia dracunculus</i> | 21–84 | – |
| | mint | MENTH | <i>Mentha</i> | 0–63 | – |
| | yellow salsify | TRDU | <i>Tragopogon dubius</i> | 21–63 | – |
| | American vetch | VIAM | <i>Vicia americana</i> | 0–42 | – |
| | upright prairie coneflower | RACO3 | <i>Ratibida columnifera</i> | 0–42 | – |
| | bluebells | MERTE | <i>Mertensia</i> | 0–42 | – |
| | purple prairie clover | DAPU5 | <i>Dalea purpurea</i> | 21–42 | – |
| | common yarrow | ACMI2 | <i>Achillea millefolium</i> | 0–42 | – |
| | onion | ALLIU | <i>Allium</i> | 0–21 | – |
| | groundplum milkvetch | ASCR2 | <i>Astragalus crassicaarpus</i> | 0–21 | – |
| | wavyleaf thistle | CIUN | <i>Cirsium undulatum</i> | 0–21 | – |
| | blacksamson echinacea | ECAN2 | <i>Echinacea angustifolia</i> | 0–21 | – |
| | sanddune wallflower | ERCAC | <i>Erysimum capitatum var. capitatum</i> | 0–21 | – |
| | scarlet beeblossom | OESU3 | <i>Oenothera suffrutescens</i> | 0–21 | – |
| | rush skeletonplant | LYJU | <i>Lygodesmia juncea</i> | 0–21 | – |
| | scarlet globemallow | SPCO | <i>Sphaeralcea coccinea</i> | 0–21 | – |
| Shrub/Vine | | | | | |
| 9 | Shrubs | | | 315–420 | |
| | silver sagebrush | ARCA13 | <i>Artemisia cana</i> | 105–315 | – |
| | big sagebrush | ARTR2 | <i>Artemisia tridentata</i> | 0–210 | – |
| | western snowberry | SYOC | <i>Symphoricarpos occidentalis</i> | 42–210 | – |
| | broom snakeweed | GUSA2 | <i>Gutierrezia sarothrae</i> | 0–105 | – |
| | prairie sagewort | ARFR4 | <i>Artemisia frigida</i> | 42–105 | – |
| | chokecherry | PRVI | <i>Prunus virginiana</i> | 21–105 | – |
| | currant | RIBES | <i>Ribes</i> | 21–105 | – |
| | rose | ROSA5 | <i>Rosa</i> | 21–63 | – |
| | leadplant | AMCA6 | <i>Amorpha canescens</i> | 0–42 | – |
| | American plum | PRAM | <i>Prunus americana</i> | 21–42 | – |
| | spicebush | SAV54 | <i>Sarcobatus vermiculatus</i> | 0–42 | – |

| | | | | | |
|-------------|---------------------|-------|--|------|---|
| | greasewood | SAVE4 | <i>Sarcobatus vermiculatus</i> | 0-40 | - |
| | silver buffaloberry | SHAR | <i>Shepherdia argentea</i> | 0-21 | - |
| | Subshrub (<.5m) | 2SUBS | <i>Subshrub (<.5m)</i> | 0-21 | - |
| | winterfat | KRLA2 | <i>Krascheninnikovia lanata</i> | 0-21 | - |
| Tree | | | | | |
| 10 | Trees | | | 0-42 | |
| | Tree | 2TREE | <i>Tree</i> | 0-21 | - |
| | boxelder | ACNE2 | <i>Acer negundo</i> | 0-21 | - |
| | green ash | FRPE | <i>Fraxinus pennsylvanica</i> | 0-21 | - |
| | plains cottonwood | PODEM | <i>Populus deltoides ssp. monilifera</i> | 0-21 | - |
| | American elm | ULAM | <i>Ulmus americana</i> | 0-21 | - |

Animal community

The following table lists annual suggested initial stocking rates with average growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of conservation planning. Often, the current plant composition does not entirely match any particular plant community (as described in this Ecological Site Description). Therefore, a resource inventory is necessary to document plant composition and production. More accurate carrying capacity estimates should eventually be calculated using the following stocking rate information along with animal preference data and actual stocking records, particularly when grazers other than cattle are involved. With consultation of the land manager, more intensive grazing management may result in improved harvest efficiencies and increased carrying capacity.

Plant Community = Rhizomatous Wheatgrass-Green Needlegrass/Silver Sagebrush (1.1)

Average Annual Production (lbs./ac, air-dry) = 2500

Stocking Rate (AUM/ac) = 0.68

Plant Community = Blue Grama-Rhizomatous Wheatgrass/Shrubs (1.2)

Average Annual Production (lbs./ac, air-dry) = 800

Stocking Rate (AUM/ac) = 0.22

Plant Community = Pioneer Perennials/Annuals/Shrubs (2.1)

Average Annual Production (lbs./ac, air-dry) = Variable **

Stocking Rate (AUM/ac) = Unknown

Plant Community = Rhizomatous Wheatgrass-Green Needlegrass-Non-Native Cool-Season Grasses/Silver Sagebrush (3.1)

Average Annual Production (lbs./ac, air-dry) = 2100

Stocking Rate (AUM/ac) = 0.57

Plant Community = Smooth Brome-Kentucky Bluegrass (>30%)/Shrubs (4.1)

Average Annual Production (lbs./ac, air-dry) = Variable **

Stocking Rate (AUM/ac) = Unknown

Plant Community = Go-back or Introduced (5.1)

Average Annual Production (lbs./ac, air-dry) = Variable **

Stocking Rate (AUM/ac) = Unknown

*Based on 912 lbs./acre (air-dry weight) per Animal Unit Month (AUM), and on 25 percent harvest efficiency of preferred and desirable forage species (refer to USDA NRCS, National Range and Pasture Handbook).

** Highly variable; stocking rate needs to be determined on-site.

Total annual production on-site may contain vegetation deemed undesirable or untargeted by the grazing animal. Therefore, AUM values may have been reduced to reflect only preferred or desirable forage species.

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 herbage production on this site. The site is dominated by soils in hydrologic groups B and C. 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 dense 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 aesthetic value that appeals to visitors.

Other products

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

Other information

Site Development and Testing Plan:

Future work, as described in a Project Plan, is necessary to upgrade this site to the Correlated level. This will include field activities to collect high-intensity sampling of vegetation, and analysis of that data. The final field review, peer review, quality control, and quality assurance reviews of the ESD will be required to produce the final "Correlated" document.

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Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range-trained personnel were also used. Those involved in developing this site description include: Stan Boltz,

Range Management Specialist, NRCS; Darrel DuVall, Range Management Specialist, NRCS; Cheryl Nielsen, Range Management Specialist, NRCS; Rick Peterson, Range Management Specialist, NRCS; and Mike Stirling, Range Management Specialist, NRCS.

Other references

EPA – Level III and Level IV Ecoregions of the Continental United States, (<https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions-continental-united-states>). Available online. Accessed 01/03/17

High Plains Regional Climate Center, University of Nebraska, (<http://www.hprcc.unl.edu/>). Available online. Accessed 02/27/17.

USDA, NRCS. Soil Survey Staff. Official Soil Series Descriptions. Available online. Accessed 04/25/17.

USDA, NRCS. Soil Survey Staff. Web Soil Survey. Available online. Accessed 04/25/17.

USDA, NRCS. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. Ag Handbook 296.

USDA, NRCS. 2014. National Ecological Site Handbook, 1st Ed.

USDA, NRCS. National Water and Climate Center. (<http://www.wcc.nrcs.usda.gov/>). Available online. Accessed 02/27/17.

USDA, NRCS. 1997, rev. 1, 2003. National Range and Pasture Handbook.

USDA, NRCS. National Soil Information System, Information Technology Center. (<http://nasis.nrcs.usda.gov>).

USDA, NRCS. 2017. The PLANTS Database (<http://plants.usda.gov>, 2017). Available online. Accessed 4/3/17.

USDA, NRCS. Various Published Soil Surveys.

Contributors

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Rick L. Peterson

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ESD updated by Rick L. Peterson, 05/24/17

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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| Approved by | Stan Boltz |
| Approval date | |

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):** 0 to 5 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 5 to 15 inches thick with mollic (dark) colors when moist. Structure typically is medium to fine granular 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- and warm-season grasses) with fine and coarse roots positively influences infiltration.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None – when dry, B horizons can be hard and appear to be compacted, but no platy structure will be present.

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 >

Sub-dominant: Mid to tall cool-season bunchgrasses = tall warm-season rhizomatous grasses > shrubs >

Other: Forbs

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):**
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Production ranges from 1,700-3,300 lbs./acre (air-dry weight). Reference value production is 2,500 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, Kentucky bluegrass, annual bromes
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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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