

# VEGETATION INVENTORY

PREPARED FOR  
THE SAND CREEK MASSACRE SITE

prepared by  
**Dr. Roy Roath** - project leader  
**Rachel Ridenour** - research technician  
**Bob Wesley** - research technician  
**Zachary Holmes** - research technician

Forest, Rangeland, and Watershed Stewardship Department  
Colorado State University



## **Executive Summary**

The Colorado State University, Forest, Rangeland and Watershed Stewardship Department was contracted by the National Park Service to complete an intensive vegetation inventory of the Sand Creek Massacre Site (SCMS) in Kiowa County, CO. This inventory measured the current plant species composition, the current ground cover composition, and photographically documented the vegetation on the site. Data collection occurred in the summer of 2005 and analysis was completed in fall 2006. The information obtained from this inventory will be used as a foundation for future management decisions at the SCMS.

The SCMS was found to be unique in terms of the potential vegetation. The site is a mix of sandhills mixed grass prairie and a highly productive shortgrass phasing into a loamy mixed grass prairie. The importance of understanding the sites ecological potential is in guiding management to return the area to its historic potential. However, it may not be possible to attain historic potential across the site due to persisting effects of disturbance.

Historic Climax Plant Communities of the Ecological Sites at the SCMS were used as a reference to classify current plant communities relative to their current ecological status. The current plant species presence and the composition of the current plant communities are evidence that historic disturbance has dramatically altered the site. The key plant species expected in the high seral communities of the Ecological Sites were present on most of the site but in much reduced abundance. Annual plants were abundant and over-represented in the area. This is a factor of both historic cultural disturbance and near-term drought effects. The drought effect is likely to be reversible in the short-term, when rainfall regimes return to more normal patterns and amounts of precipitation. In contrast, those areas disturbed through agriculture and infrastructure have been pushed beyond ecological thresholds that have significantly altered the ecological potential of these areas for the foreseeable future.





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## Introduction

This study of the Sand Creek Massacre Site (SCMS) was conducted for the National Park Service (NPS) through the Forest, Rangeland, and Watershed Stewardship Department at Colorado State University. The SCMS is a memorial of the 1864 military engagement between the Third Colorado Cavalry Regiment and the Cheyenne and Arapaho Nations and its ongoing significance to the Cheyenne and Arapaho peoples. The site is located along Big Sandy Creek in Kiowa County, Colorado and encompasses about 2400 acres (see Appendices A-I, II, & III). This land has been utilized for a wide variety of uses, including an encampment, grazing, row crops, and even an air landing strip (see Appendix A-IV). The purpose of this study was to provide an inventory of the rangeland resources and baseline biological information about the vegetation to serve as the foundation for future management decisions.

The site contains a variety of upland and bottomland Ecological Sites (USDA, NRCS 2004) determined by the underlying soils and the local climate (see Appendices A-V & VI). Soil textures range from sandy to loamy and many bottomland areas are saline. Wetlands are found on the site and include at least four different wetland associations (see Appendix VII). The creek is not presently running and is lined with a stand of large cottonwood trees. A spring that originates just northeast of the property feeds the wetlands. A historical irrigation canal also cuts through the property but has been breached and is not currently functioning. The site is bordered by grazing land and crop land.



**Figure 1: Sand Creek Massacre Site Aerial Photo** - Aerial photograph of the Sand Creek Massacre Historic Site looking southeast on June 6, 1998. Image courtesy of Jim Wark of AirPhoto.

The SCMS provides habitat for a variety of wildlife species. Active prairie dog towns occupy approximately 200 acres of the site (see Appendix A-IV). These towns also harbor burrowing owls & rattlesnakes. Other SCMS bird species include: Red Tailed Hawk, Ferruginous Hawk, Golden

Eagle, Killdeer, and Mourning Dove, among others. Other snake species on the site include: garter snakes, green racers, and bull snakes. Both whitetail and mule deer frequent the site. Box turtles, porcupine, lesser earless lizards, great plain toads, black-tailed jackrabbits, and cottontail rabbits were also noted. For a complete list of wildlife observed, see Appendix B. It should be noted that wildlife was not sought out or rigorously identified. Those species listed are merely observations from the field crew made during the summer of 2005.

The climate of Kiowa County is common for most temperate areas, with an average winter high temperature of 32°F and an average summer high temperature of 90°F. The area receives 12-16 inches of annual precipitation, 80% of which falls between April and September mostly as rain but sometimes as snow. The remaining annual precipitation falls as snow in the winter with an average seasonal accumulation of 27 inches. Intense thunder and hailstorms are common in the summer months and drought occurs in two years out of every ten (USDA, SCS 1981).



## Methods

Field sampling occurred during May-July of 2005. Data entry and analysis was conducted at Colorado State University throughout 2006 using Microsoft Excel™.

### ***Ecological Site Descriptions***

The Natural Resources Conservation Service (NRCS) has provided a tool, Ecological Site Descriptions, to assist in understanding land capability. Ecological Sites are based on soils and climatic response units. Data gathered across the climatic region, within soils types, has been combined with ecological understanding to define ecological response units, or Ecological Sites, that are known to behave in relatively predictable ways. These units define how the land will respond ecologically and what the various seral communities within that soil type will look like. This model not only allows the user to predict where current communities are on a relative seral scale but define ecological processes that mediate transitions from one community to another. The SCMS project has used this Ecological Site information to classify communities relative to their current ecological status. In addition, this information will allow predictive capability as to what the historic vegetation might have looked like and how to “move” the current communities toward the nearest reasonable resemblance of those conditions.

### ***Stratification***

NRCS Ecological Site Descriptions in conjunction with soils maps from the Soil Survey of Kiowa County, Colorado were used to define Ecological Site boundaries on the SCMS (see Appendix A-V & VI). Some Ecological Site boundaries vary slightly from the areas defined in the soil survey (see Appendix A-VIII). On the ground observations revealed some areas more closely resembled a different Ecological Site. Consequently, these areas were reassigned to a new Ecological Site. Strata were defined within Ecological Sites by visual differences in community types; these strata are referred to as community strata (see Appendix A-IX & X). Community strata are not necessarily contiguous pieces of land. In total, there are 33 community strata on the SCMS. Three to five transects, depending on community diversity and stratum size, were placed in representative areas throughout each community stratum (see Appendix A-XI). GPS locations taken using the North American Datum of 1983 (NAD 83) mark the locations of all transects and are included in Appendix C. Seral strata were then created by grouping community strata of the same seral stage and Ecological Site (see Appendix A-XII & XIII). The Historical Climax Plant Communities (HCPC) outlined in the Ecological Site Descriptions were used as references to determine rangeland seral stage. Seral stages found at SCMS include early seral, early-mid seral, and mid seral (see Appendix B-XIV). Seral strata are not necessarily contiguous pieces of land and may contain only one community stratum. There are a total of 16 seral strata on the SCMS. The following diagram, Figure 2, is an example of the above mentioned stratification structure and uses fabricated data for illustrative purposes.

**Salt Meadow = Ecological Site**

**Salt Meadow Early-Mid Seral = Seral Strata**

**Salt Meadow R = Community Strata**

**Salt Meadow S = Community Strata**

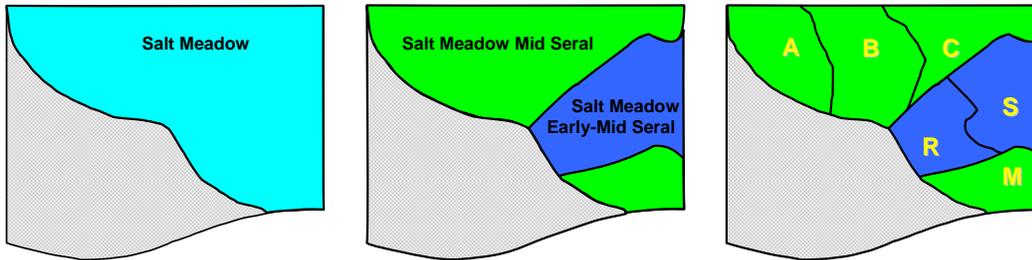
**Salt Meadow Mid Seral = Seral Strata**

**Salt Meadow A = Community Strata**

**Salt Meadow B = Community Strata**

**Salt Meadow C = Community Strata**

**Salt Meadow M = Community Strata**



**Figure 2: Stratification Methods Diagram** - Illustration of land stratification on the Sand Creek Massacre Site. In this example, the Salt Meadow Ecological Site is shown in turquoise. The Salt Meadow Ecological Site has two seral strata, Early-Mid Seral in blue and Mid Seral in green. Salt Meadow Early-Mid Seral has two community strata labeled in yellow within it, Salt Meadow R and S. Salt Meadow Mid Seral has four community strata labeled in yellow within it, Salt Meadow A, B, C, and M.

**Vegetation Sampling**

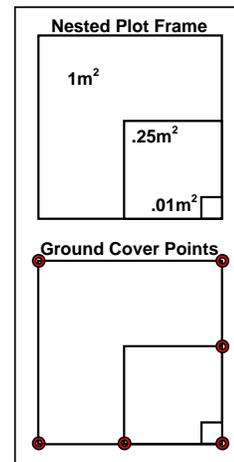
**Frequency**

Vegetation abundance was recorded using the nested plot frequency method (Smith, Bunting, & Hironaka 1986, 1987). Nested plot sizes were 1m<sup>2</sup>, .25m<sup>2</sup>, and .01m<sup>2</sup>(see Figure 3). This method allowed sampling an adequate number of areas along randomly located transects within community strata in a short time while maintaining sample sensitivity to species diversity.

Nested plot frames were placed on 100m transects and read every five meters, totaling 20 plots per transect. All species occurring within the frame were recorded once per plot according to the smallest nested plot in which they were found.

**Ground Cover**

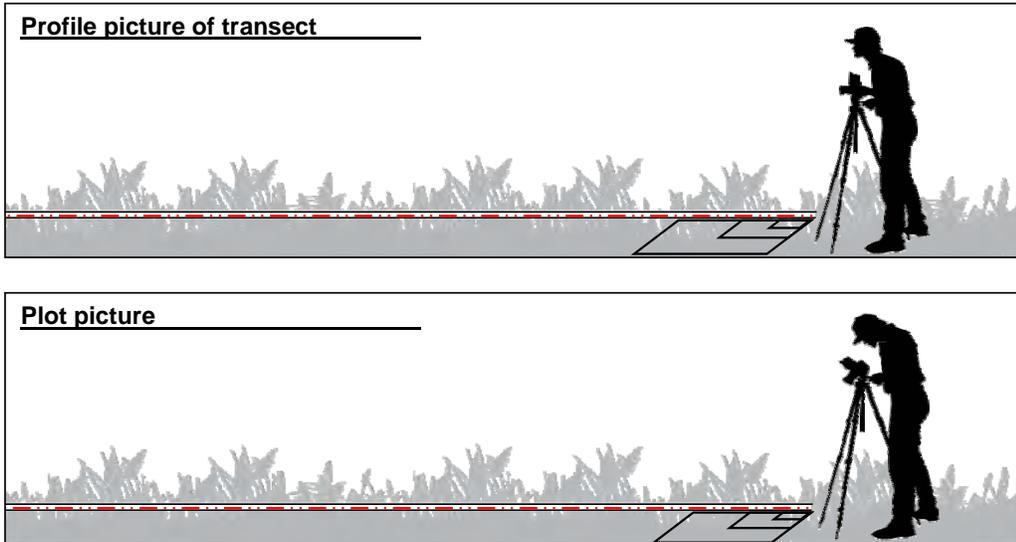
Ground cover was measured in four classes: (1) Plant (living), (2) Litter, (3) Bare Ground, and (4) Rock. Cover measurements were taken at six points on every plot by recording the cover class present at the soil surface directly below six predetermined points on the frame (see Figure 3).



**Figure 3: Nest Plot Frame and Ground Cover Point Diagram** - The top illustration shows a one meter square nested plot. The lower diagram shows the six points used for ground cover measurement.

## Photography

Photos were taken at one transect in every stratum. The photos include a profile picture of the transect, one of the plot (from approximately 1.5m above), and a photos of the surrounding area. Figure 4 below demonstrates the photography techniques used at the SCMS. Some strata have surrounding photos taken in the four cardinal directions and are arranged so in this report. Future photographs taken from the same location will be used to track conditions of the site through time.



**Figure 4: Photography Techniques** - Illustration of photographic practices used to document the Sand Creek Massacre Site.

## Plant Taxonomy

All plants were first identified using, *Flora of the Great Plains*, *Grasses of North America*, or *Field Guide to Sedge Species of the Rocky Mountain Region*. Species were then updated through the USDA PLANTS Database and Mary Barkworth's *Names and Mapping Systems*. Many specimens were found that could not be identified due to insufficient plant material. Of these specimens, those that could be identified to genus were labeled respectively and numbered (i.e. *Astragalus* #1 or *Chenopodium* #3). If the specimen could not be identified to genus it was given an identification code. Codes began with prefixes to denote growth form; these were UF = unidentified forb and UG = unidentified grass. The prefix was followed by a number to differentiate species (i.e. UF24 or UG1). Several plant species included in the species list were not found within the transects but were collected on the site and identified. A complete plant species list is located in Appendix D.

## Analyses

The data gathered for plant frequency was analyzed for mean relative frequency of occurrence in the 1m<sup>2</sup> plots. Data analysis indicated that the largest frame size (1m<sup>2</sup>) was most representative of the diversity of the site so this size was used in all analysis. It should be noted that data is available for all nested plot sizes but was not utilized in this report. The nested plot data can be subjected to analysis of variance procedures in future sampling to determine changes in presence of a focus plant species or change in the plant community. Mean frequency and standard error for each species at a stratum level were derived using Microsoft

Excel's™ descriptive statistics function. Relative frequency for a species was then calculated by dividing the species' frequency by the sum frequency of all species encountered on all transects within the stratum. This analysis was conducted for each community stratum and each seral stratum. Mean relative frequency was used a surrogate for composition by weight and was compared to composition of the HCPC for the Ecological Site. Ground cover is a simple percentage of ground cover by cover class within a stratum.

## Results

This inventory revealed that the plant communities at the SCMS are not at their ecological potential. Most strata within the site are lacking key species of their HCPC. Key species such as big bluestem, green needlegrass, fourwing saltbush, and western sandcherry were not observed within the study area. Many strata contain an overabundance of low seral forbs in comparison with the HCPC. Most areas are dominated by blue grama, sand dropseed, and sagebrush. Many low lying areas were choked with Russian thistle litter, up to 2 feet deep. Also a large monocultural swath of poison milkweed was detected along the creek bed.

The results are arranged in a hierarchy. Results are first organized by Ecological Site and each Ecological Site section is headed by an Ecological Site Description adapted from the NRCS Field Office Technical Guide. There was no analysis conducted at the Ecological Site level. Within an Ecological Site section, community strata are grouped and analyzed by seral stage; these groupings are referred to as seral strata. Finally, each community stratum is analyzed individually. Some seral strata have only one community stratum within them; in these instances, the community stratum analysis is listed in place of the seral stratum analysis. Current conditions of each stratum will now be addressed individually.



## Loamy:

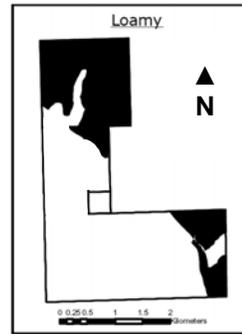
**Site Type:** Rangeland

**Site Name:** Loamy

**Site ID:** R067BY002CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**Soil Classification:** Ustollic Haplargids \*



### **Physiographic Features**

This site occurs on nearly level to gently sloping plains and terraces. It has no significant ponding or flooding and a runoff class of low to medium.

### **Soil Features**

The soils of this site are typically very deep but may also include moderately deep soils. Typically, they are well drained and are moderately slow or moderately permeable. Typically, these soils formed in loamy loess and eolian deposits derived from mixed calcareous sources. Some soils formed in loamy alluvium derived from mixed calcareous sources. These soils occur on upland plains, and terraces. The available water capacity is typically high for the very deep soils and low to moderate for the moderately deep soils. The soil surface layer ranges from 3 to 16 inches thick and is typically loam or silt loam. The pH of these soils ranges from neutral to moderately alkaline. The soil moisture regime is typically aridic ustic with some ustic aridic in the drier areas. The soil temperature regime is mesic.

The Historic Climax Plant Community (HCPC) should show slight to no evidence of rills, wind scoured areas or pedestaled 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. Sub-surface soil layers are non-restrictive to water movement and root penetration.

Major soil series correlated to this Ecological Site include: Adena, Altvan, Ascalon (loam), Baca (loam), Colby (0-5%), Fort Collins, Harbord, Iliff, Keith, Kimst, Kuma, Norka, Nucla, Nunn (loam), Platner, Rago, Renohill, Richfield, Rosebud, Satanta, Stoneham, Thedalund, Ulmet, Ulysses, Wages, Weld and Wiley.

**Parent Material Kind:** loess, eolian deposits, alluvium

**Parent Material Origin:** mixed-calcareous

**Surface Texture:** loam, silt loam, very fine sandy loam

**Surface Texture Modifier:** none

**Subsurface Texture Group:** loamy

**Surface Fragments < 3" (% Cover):** 0

**Surface Fragments > 3" (%Cover):** 0

**SubSurface Fragments < 3" (% Volume):** 0 - 15

**Subsurface Fragments > 3" (% Volume):** 0

**Drainage Class:** well

**Permeability Class:** slow - moderate

**Depth (inches):** 40 - 80

**Electrical Conductivity (mmhos/cm) \*\*:** 0.00 - 2.00

**Sodium Absorption Ratio\*\*:** 0

**Soil Reaction (1:1 Water) \*\*:** 6.6 - 8.4

**Available Water Capacity (inches) \*\*:** 3 - 8

**Calcium Carbonate Equivalent (percent) \*\*:** 0 - 15

\* A complete soil classification table for Kiowa County is located in Appendix E.

\*\*These attributes represent 0-40 inches in depth or to the first restrictive layer.

**Historic Climax Plant Community:**

The historic climax plant community (description follows) has been determined by study of rangeland relic areas, areas protected from excessive disturbance, seasonal use pastures, short durational/time controlled grazing and historical accounts.

The plant community described should not necessarily be thought of as the “Desired Plant Community”. According to the United States Department of Agriculture (USDA) NRCS National Range and Pasture Handbook, Desired Plant Communities will be determined by the decision-makers and will meet minimum quality criteria established by the NRCS. The main purpose for, including any description of a plant community here is to capture the current knowledge and experience at the time.

**Western Wheatgrass, Blue Grama, Green Needlegrass, Fourwing saltbush Plant Community**

This is the interpretive plant community and is considered to be the Historic Climax Plant Community (HCPC). This plant community evolved with grazing by large herbivores and is well suited for grazing by domestic livestock and can be found on areas that are properly managed with prescribed grazing that allows for adequate recovery periods following each grazing event. The potential vegetation is about 70-85% grasses and grass-like plants, 5-15% forbs and 10-15% woody plants.

The major grasses include western wheatgrass, green needlegrass and blue grama. Sub-dominant grasses include needleandthread, buffalograss and sand dropseed. Major forbs and shrubs include American vetch, upright prairie coneflower, scarlet globemallow, dotted gayfeather, fourwing saltbush and winterfat.

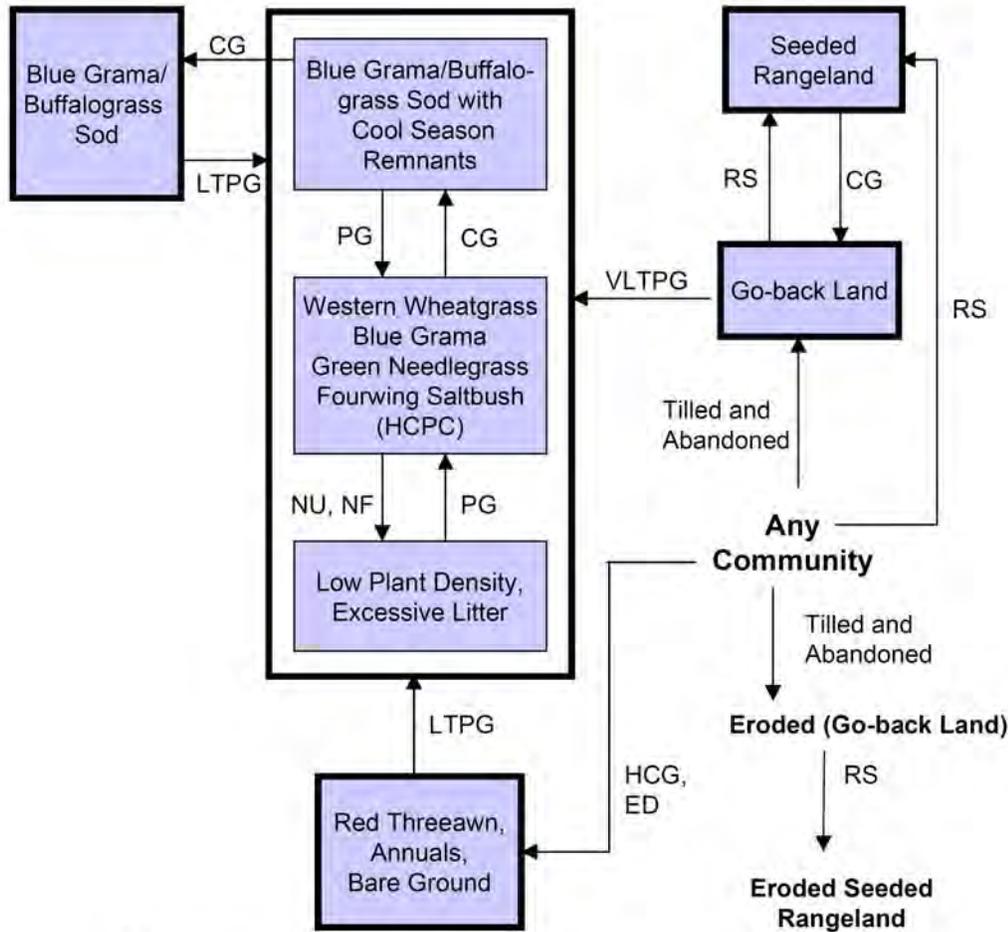
This plant community is diverse, stable, and productive. Litter is properly distributed with very little movement off-site and natural plant mortality is very low. It is well suited to carbon sequestration, water yield, wildlife use by many species, livestock use and is esthetically pleasing. Community dynamics, nutrient cycle, water cycle and energy flow are functioning properly. This community is resistant to many disturbances except continuous grazing, tillage and/or development into urban or other uses.

Total annual production ranges from 600 to 1800 pounds of air-dry vegetation per acre and will average 1300 pounds during an average year.

**Plant Communities and Transitional Pathways**

Deterioration of this site, due to continuous grazing without adequate recovery periods following each grazing occurrence, will cause blue grama and buffalograss to increase and eventually form a sod. Cool season grasses such as green needlegrass and western wheatgrass will decrease in frequency and production as well as key shrubs such as fourwing saltbush and winterfat. American vetch and other highly palatable forbs will decrease also. Red threeawn, annuals and bare ground increases under heavy continuous grazing or excessive defoliation.

The following diagram illustrates the common plant communities that can occur on the site and the transition pathways (arrows) among communities. Bold lines surrounding each plant community or communities represent ecological thresholds (USDA, NRCS 2004). The ecological processes are discussed in more detail in the Ecological Site Description from the NRCS Field Office Technical Guide.



**CG** - continuous grazing w/o adequate recovery opportunity, **ED** - excessive defoliation, **HCG** - heavy continuous grazing, **HCPC** - Historic Climax Plant Community, **LTPG** - long term prescribed grazing (>40 yrs), **NF** - no fire, **NU** - non use, **PG** - prescribed grazing with adequate recovery period, **RS** - range seeding, **VLTPG** - very long term prescribed grazing (>80 yrs)

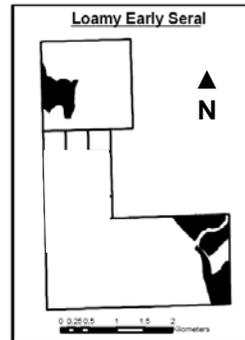
**Figure 5: Loamy State and Transition Model** - Diagram of the Loamy Ecological Site MRLA 67B community states and transitions (USDA, NRCS 2004).

## Loamy Early Seral

All areas of the Loamy Early Seral Stratum have active prairie dog towns.

This area has transitioned to a **Blue Grama/Buffalograss Sod Plant Community**, a state usually reached through continuous grazing. Most dominant grasses from the HCPC were detected below HCPC levels, including western wheatgrass and blue grama at 0.29% ( $\pm$  0.29) and 8.96% ( $\pm$  1.13), respectively. The other dominant grass, green needlegrass, was not detected. The current dominant grass species were detected at 13.87% ( $\pm$  0.90) buffalograss, 8.96% ( $\pm$  1.13) blue grama, 3.47% ( $\pm$  0.90) red threeawn, 2.31% ( $\pm$  0.77) hairy grama, and 2.02 ( $\pm$  0.72) sand dropseed. Many dominant forbs from the HCPC were not detected, including American vetch, dotted gayfeather, narrowleaf penstemon, and purple prairie clover. The other dominant forbs, were detected at 13.01% ( $\pm$  0.98) scarlet globemallow (four times the HCPC level), 1.73% ( $\pm$  0.68) ironplant goldenweed, and 1.16% ( $\pm$  0.56) upright prairie coneflower. The current dominant forb species were detected at a relative abundance of 14.16% ( $\pm$  0.87) stiff flax, 13.01% ( $\pm$  0.98) scarlet globemallow, 9.54% ( $\pm$  1.12) wallflower, and 6.07% ( $\pm$  1.08) Russian thistle. The dominant shrubs of the HCPC, fourwing saltbush and winterfat, were not detected. Broom snakeweed, plains pricklypear, and brittle cactus were detected at suitable levels for the HCPC at 0.58% ( $\pm$  0.41), 0.58% ( $\pm$  0.41), and 0.31% ( $\pm$  0.31), respectively.

Much of the diversity and production of HCPC has been lost with the cool season grasses, shrubs, and nitrogen fixing forbs. This has negatively affected energy/nutrient cycling and a shallow "root pan" of blue grama/buffalograss sod has greatly reduced infiltration. The Blue Grama/Buffalograss Sod Plant Community is usually resistant to change due to the grazing tolerance of blue grama and buffalograss. This tolerance assumes ungulate grazing but this area of the SCMNH is primarily grazed by prairie dogs that graze for food and visibility. This makes the blue grama/buffalograss sod vulnerable and in turn makes erosion a concern. Although many of the dominant plant species of the HCPC are not found within the Loamy Early Seral stratum, most of the species are found within the SCMNH. Species not found on the SCMNH include: green needlegrass, American vetch, narrowleaf penstemon, fourwing saltbush, and winterfat. However, these species may be present on neighboring lands.



## Loamy Early Seral

**Site Type:** Rangeland

**Site Name:** Loamy

**Site ID:** R067BY002CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 340

**Date:** June 2005

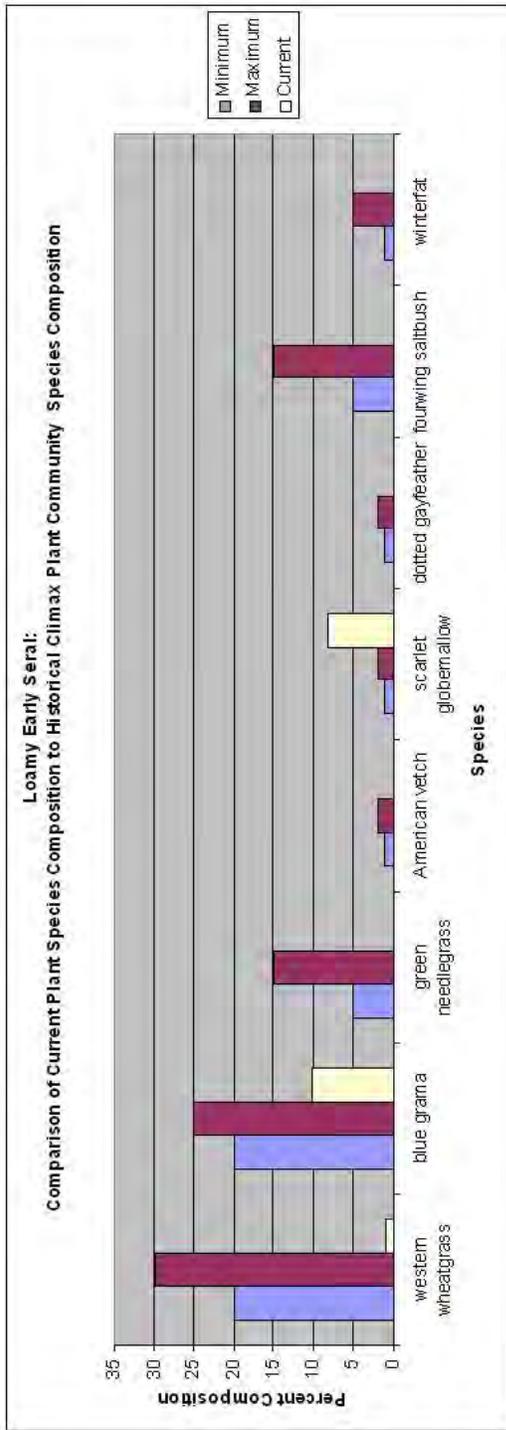
**Table 1: Loamy Early Seral Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>				
western wheatgrass	<i>Pascopyrum smithii</i>	20-30	0.90	0.20
blue grama	<i>Bouteloua gracilis</i>	20-25	10.13	0.42
green needlegrass	<i>Nassella viridula</i>	5-15	0.00	0.00
buffalograss	<i>Buchloe dactyloides</i>	1-5	11.78	0.38
sand dropseed	<i>Sporobolus cryptandrus</i>	1-3	2.64	0.32
bottlebrush squirreltail	<i>Elymus elymoides</i>	0-1	1.93	0.28
Indian ricegrass	<i>Achnatherum hymenoides</i>	0-1	0.00	0.00
little bluestem	<i>Schizachyrium scoparium</i>	0-1	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	0-1	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	0-1	6.41	0.43
ring muhly	<i>Muhlenbergia torreyi</i>	0-1	0.14	0.08
sideoats grama	<i>Bouteloua curtipendula</i>	0-1	0.09	0.07
sixweeks fescue	<i>Vulpia octoflora</i>	0-1	0.09	0.07
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
needleleaf sedge	<i>Carex duriuscula</i>	0-1	0.00	0.00
<b>Other native grasses</b>		1-3	3.35	0.71
hairy grama	<i>Bouteloua hirsuta</i>		0.38	0.13
inland saltgrass	<i>Distichlis spicata</i>		1.98	0.29
prairie threeawn	<i>Aristida oligantha</i>		0.24	0.10
tumblegrass	<i>Schedonnardus paniculatus</i>		0.75	0.18
<b>Forbs</b>				
American vetch	<i>Vicia americana</i>	1-5	0.00	0.00
scarlet globemallow	<i>Sphaeralcea coccinea</i>	1-3	8.11	0.44
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
ironplant goldenweed	<i>Haplopappus spinulosus</i>	1-2	2.45	0.31
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	1-2	0.19	0.09
purple prairie clover	<i>Dalea purpurea</i>	1-2	0.00	0.00
slimflower scurfpea	<i>Psoralidium tenuiflorum</i>	0-1	2.92	0.34
woolly locoweed	<i>Astragalus mollissimus</i>	0-1	0.52	0.15
silky crazyweed	<i>Oxytropis sericea</i>	0-1	1.32	0.24
silky sophora	<i>Sophora nuttalliana</i>	0-1	0.00	0.00
variable senecio	<i>Packera neomexicana var. mutabilis</i>	0-1	0.00	0.00
plains bahia	<i>Picradeniopsis oppositifolia</i>	0-1	0.00	0.00

Colorado fourclock	<i>Mirabilis multiflora</i>	0-1	0.00	0.00
cutleaf evening-primrose	<i>Oenothera coronopifolia</i>	0-1	0.00	0.00
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.00	0.00
rush skeletonplant	<i>Lygodesmia juncea</i>	0-1	1.79	0.27
scarlet gaura	<i>Gaura coccinea</i>	0-1	1.37	0.24
wavyleaf thistle	<i>Cirsium undulatum</i>	0-1	0.75	0.18
western ragweed	<i>Ambrosia psilostachya</i>	0-1	3.16	0.35
woolly Indianwheat	<i>Plantago patagonica</i>	0-1	9.05	0.43
<b>Other native forbs</b>		2-5	21.49	3.74
Astragalus sp.	<i>Astragalus sp.</i>		0.24	0.10
Astragalus sp. #2	<i>Astragalus sp.</i>		0.19	0.09
beggars tick	<i>Cryptantha circumscissa</i>		1.18	0.23
blanket flower	<i>Gaillardia pulchella</i>		0.00	0.00
broadleaf milkweed	<i>Asclepias latifolia</i>		0.05	0.05
bush morning glory	<i>Ipomoea leptophylla</i>		0.05	0.05
common sunflower	<i>Helianthus annuus</i>		0.05	0.05
conyza	<i>Conyza canadensis</i>		1.79	0.27
curlycup gumweed	<i>Grindelia squarrosa</i>		0.24	0.10
evening-primrose	<i>Oenothera spp.</i>		0.28	0.11
flatspine stickseed	<i>Lappula echinata var. occidentalis</i>		0.57	0.16
groundplum milkvetch	<i>Astragalus crassicaarpus</i>		0.38	0.13
hairy goldenaster	<i>Heterotheca villosa</i>		0.14	0.08
heath aster	<i>Symphotrichum ericoides</i>		0.09	0.07
Hymenopappus sp.	<i>Hymenopappus sp.</i>		0.28	0.11
James rushpea	<i>Caesalpinia jamesii</i>		0.05	0.05
Missouri milkvetch	<i>Astragalus missouriensis</i>		0.42	0.14
Nuttalls evolvulus	<i>Evolvulus nuttallianus</i>		0.05	0.05
Oxytropis sp.	<i>Oxytropis sp.</i>		0.14	0.08
palmleaf scurfpea	<i>Psoralea digitata</i>		0.05	0.05
pepperpod mustard	<i>Lepidium densiflorum</i>		0.24	0.10
prostrate vervain	<i>Verbena bracteata</i>		0.52	0.15
short-ray prairie coneflower	<i>Ratibida tagetes</i>		0.24	0.10
snow on the mountain	<i>Euphorbia marginata</i>		0.05	0.05
stiff flax	<i>Linum rigidum</i>		8.95	0.43
thyme-leaved spurge	<i>Chamaesyce serpyllifolia ssp. serpyllifolia</i>		0.19	0.09
narrowleaf poisonvetch	<i>Astragalus pectinatus</i>		0.09	0.07
velvet gaura	<i>Gaura parviflora</i>		0.05	0.05
wallflower	<i>Erysimum asperum</i>		4.29	0.39
white beardtongue	<i>Penstemon albidus</i>		0.05	0.05
white prairie clover	<i>Dalea candida</i>		0.09	0.07
winecup	<i>Callirhoe involucrata</i>		0.33	0.12
yellow flax			0.19	0.09
<b>Non native forbs</b>		0	6.36	0.77
kochia	<i>Kochia scoparia</i>		0.14	0.08
Russian thistle	<i>Salsola iberica</i>		2.54	0.32
yellow sweetclover	<i>Melilotus officinalis</i>		3.68	0.37
<b>Unidentified forbs</b>				
UF99	<i>Brassicaceae</i>		0.52	0.15
Shrubs				

fourwing saltbush	<i>Atriplex canescens</i>	5-15	0.00	0.00
winterfat	<i>Krascheninnikovia lanata</i>	1-5	0.00	0.00
rubber rabbitbrush	<i>Ericameria nauseosa ssp. nauseosa</i>	0-1	0.00	0.00
broom snakeweed	<i>Gutierrezia sarothrae</i>	0-1	1.84	0.28
fringed sagebrush	<i>Artemisia frigida</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.14	0.08
purple pincushion	<i>Escobaria vivipara var. vivipara</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-3	0.57	0.26
brittle cactus	<i>Opuntia fragilis</i>		0.05	0.05
green rabbitbrush	<i>Chrysothamnus visidiflorus</i>		0.14	0.08
sand sagebrush	<i>Artemisia filifolia</i>		0.38	0.13

Ground Cover	
Type	% Cover
Plant	30.98
Litter	34.61
Bare	34.31
Rock	0.05
n	2040



**Figure 6: Loamy Early Seral Species Composition** - This graph depicts the current plant species composition compared to the potential vegetation. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

## Loamy Early Seral



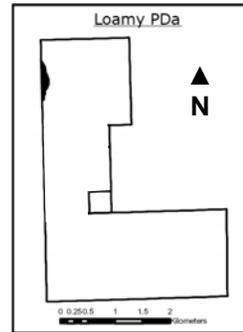
**Figure 7: Photographs of Loamy Early Seral** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Loamy PDa

The Loamy PDa stratum is located on northwest portion of the property. Loamy PDa is north of Sand Creek and occupies NPS land on section 13 T17S R46W. Loamy PDa has an active prairie dog town that continues onto section 14 T17S R46W owned by Charles B. & Frances Bowen.

This area has transitioned to a **Blue Grama/Buffalograss Sod Plant Community**, a state usually reached through continuous grazing. Two dominant grasses from the HCPC were detected below HCPC levels, including western wheatgrass and blue grama at 0.29% ( $\pm 0.29$ ) and 8.96% ( $\pm 1.13$ ), respectively. The other dominant grass, green needlegrass, was not detected. The current dominant grass species were detected at 13.87% ( $\pm 0.90$ ) buffalograss, 8.96% ( $\pm 1.13$ ) blue grama, 3.47% ( $\pm 0.90$ ) red threeawn, 2.31% ( $\pm 0.77$ ) hairy grama, and 2.02 ( $\pm 0.72$ ) sand dropseed. Many dominant forbs from the HCPC were not detected, including American vetch, dotted gayfeather, narrowleaf penstemon, and purple prairie clover. The other dominant forbs, were detected at 13.01% ( $\pm 0.98$ ) scarlet globemallow (four times the HCPC level), 1.73% ( $\pm 0.68$ ) ironplant goldenweed, and 1.16% ( $\pm 0.56$ ) upright prairie coneflower. The current dominant forb species were detected at a relative abundance of 14.16% ( $\pm 0.87$ ) stiff flax, 13.01% ( $\pm 0.98$ ) scarlet globemallow, 9.54% ( $\pm 1.12$ ) wallflower, and 6.07% ( $\pm 1.08$ ) Russian thistle. The dominant shrubs of the HCPC, fourwing saltbush and winterfat, were not detected. Broom snakeweed, plains pricklypear, and brittle cactus were detected at suitable levels for the HCPC at 0.58% ( $\pm 0.41$ ), 0.58% ( $\pm 0.41$ ), and 0.31% ( $\pm 0.31$ ), respectively.

Much of the diversity and production of HCPC has been lost with the cool season grasses, shrubs, and nitrogen fixing forbs. This has negatively affected energy/nutrient cycling and a shallow "root pan" of blue grama/buffalograss sod has greatly reduced infiltration. The Blue Grama/Buffalograss Sod Plant Community is usually resistant to change due to the grazing tolerance of blue grama and buffalograss. This tolerance assumes ungulate grazing but this area of the SCMNH is primarily grazed by prairie dogs that graze for food and visibility. This makes the blue grama/buffalograss sod vulnerable and in turn makes erosion a concern. Although many of the dominant plant species of the HCPC are not found within the Loamy PDa stratum, most of the species are found within the SCMNH. Species not found on the SCMNH include: green needlegrass, American vetch, narrowleaf penstemon, fourwing saltbush, and winterfat. However, these species may be present on neighboring lands.



## Loamy PDa

**Site Type:** Rangeland

**Site Name:** Loamy

**Site ID:** R067BY002CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 60

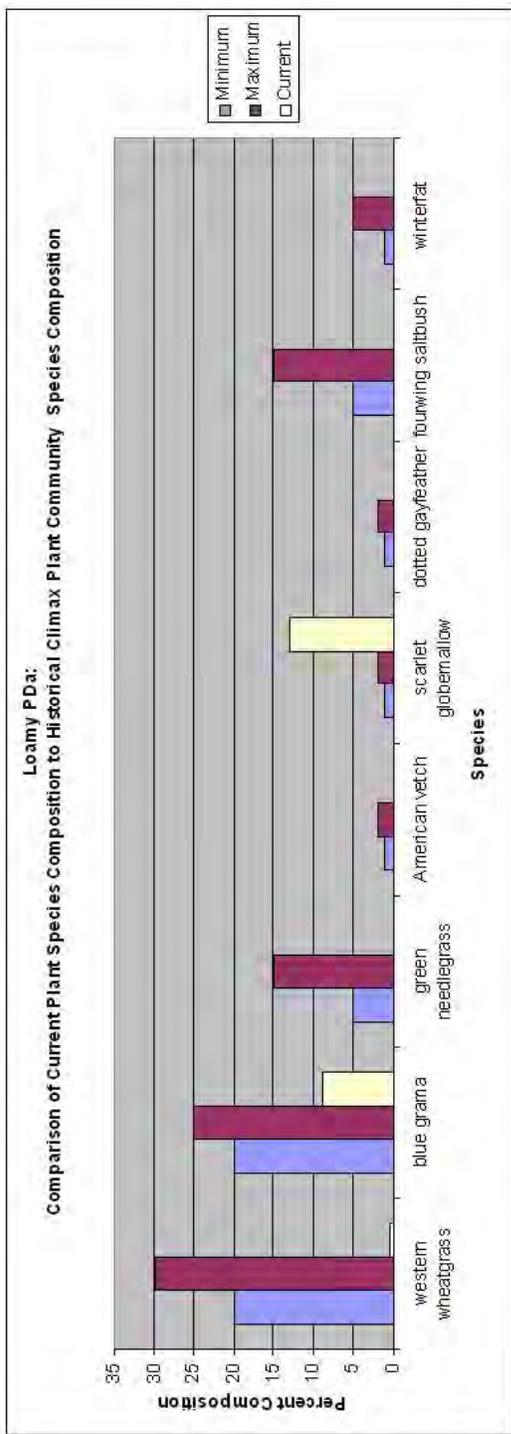
**Date:** June 2005

**Table 2: Loamy PDa Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>				
western wheatgrass	<i>Pascopyrum smithii</i>	20-30	0.29	0.29
blue grama	<i>Bouteloua gracilis</i>	20-25	8.96	1.13
green needlegrass	<i>Nassella viridula</i>	5-15	0.00	0.00
buffalograss	<i>Buchloe dactyloides</i>	1-5	13.87	0.90
sand dropseed	<i>Sporobolus cryptandrus</i>	1-3	2.02	0.72
bottlebrush squirreltail	<i>Elymus elymoides</i>	0-1	1.45	0.62
Indian ricegrass	<i>Achnatherum hymenoides</i>	0-1	0.00	0.00
little bluestem	<i>Schizachyrium scoparium</i>	0-1	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	0-1	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	0-1	3.47	0.90
ring muhly	<i>Muhlenbergia torreyi</i>	0-1	0.00	0.00
sideoats grama	<i>Bouteloua curtipendula</i>	0-1	0.58	0.41
sixweeks fescue	<i>Vulpia octoflora</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
needleleaf sedge	<i>Carex duriuscula</i>	0-1	0.00	0.00
<b>Other native grasses</b>		1-3	2.60	1.06
hairy grama	<i>Bouteloua hirsuta</i>		2.31	0.77
tumblegrass	<i>Schedonnardus paniculatus</i>		0.29	0.29
<b>Forbs</b>				
American vetch	<i>Vicia americana</i>	1-5	0.00	0.00
scarlet globemallow	<i>Sphaeralcea coccinea</i>	1-3	13.01	0.98
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
ironplant goldenweed	<i>Haplopappus spinulosus</i>	1-2	1.73	0.68
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	1-2	1.16	0.56
purple prairie clover	<i>Dalea purpurea</i>	1-2	0.00	0.00
slimflower scurfpea	<i>Psoraleidium tenuiflorum</i>	0-1	2.31	0.77
woolly locoweed	<i>Astragalus mollissimus</i>	0-1	0.00	0.00
silky crazyweed	<i>Oxytropis sericea</i>	0-1	0.00	0.00
silky sophora	<i>Sophora nuttalliana</i>	0-1	0.00	0.00
variable senecio	<i>Packera neomexicana var. mutabilis</i>	0-1	0.00	0.00
plains bahia	<i>Picradeniopsis oppositifolia</i>	0-1	0.00	0.00
Colorado fourclock	<i>Mirabilis multiflora</i>	0-1	0.00	0.00
cutleaf evening-primrose	<i>Oenothera coronopifolia</i>	0-1	0.00	0.00

Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.00	0.00
rush skeletonplant	<i>Lygodesmia juncea</i>	0-1	1.73	0.68
scarlet gaura	<i>Gaura coccinea</i>	0-1	1.16	0.56
wavyleaf thistle	<i>Cirsium undulatum</i>	0-1	0.00	0.00
western ragweed	<i>Ambrosia psilostachya</i>	0-1	0.00	0.00
woolly Indianwheat	<i>Plantago patagonica</i>	0-1	3.47	0.90
<b>Other native forbs</b>		2-5	33.53	7.01
beggars tick	<i>Cryptantha circumscissa</i>		0.29	0.29
common sunflower	<i>Helianthus annuus</i>		0.29	0.29
conyza	<i>Conyza canadensis</i>		0.87	0.49
evening-primrose	<i>Oenothera spp.</i>		1.16	0.56
flatspine stickseed	<i>Lappula echinata var. occidentalis</i>		1.45	0.62
Hymenopappus sp.	<i>Hymenopappus sp.</i>		0.58	0.41
Oxytropis sp.	<i>Oxytropis sp.</i>		0.87	0.49
palmleaf scurfpea	<i>Psoralea digitata</i>		0.29	0.29
pepperpod mustard	<i>Lepidium densiflorum</i>		0.58	0.41
prostrate vervain	<i>Verbena bracteata</i>		0.29	0.29
stiff flax	<i>Linum rigidum</i>		14.16	0.87
thyme-leaved spurge	<i>Chamaesyce serpyllifolia ssp. serpyllifolia</i>		3.18	0.87
narrowleaf poisonvetch	<i>Astragalus pectinatus</i>		0.00	0.00
wallflower	<i>Erysimum asperum</i>		9.54	1.12
<b>Non native forbs</b>		0	7.23	1.64
Russian thistle	<i>Salsola iberica</i>		6.07	1.08
yellow sweetclover	<i>Melilotus officinalis</i>		1.16	0.56
<b>Shrubs</b>				
fourwing saltbush	<i>Atriplex canescens</i>	5-15	0.00	0.00
winterfat	<i>Krascheninnikovia lanata</i>	1-5	0.00	0.00
rubber rabbitbrush	<i>Ericameria nauseosa ssp. nauseosa</i>	0-1	0.00	0.00
broom snakeweed	<i>Gutierrezia sarothrae</i>	0-1	0.58	0.41
fringed sagebrush	<i>Artemisia frigida</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.58	0.41
purple pincushion	<i>Escobaria vivipara var. vivipara</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-3	0.29	0.29
brittle cactus	<i>Opuntia fragilis</i>		0.29	0.29

<b>Ground Cover</b>	
Type	% Cover
Plant	38.33
Litter	30.28
Bare	31.39
Rock	0.00
n	360



**Figure 8: Loamy P Da Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

## Loamy PDA



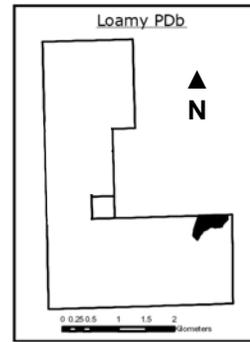
**Figure 9: Photographs of Loamy PDA** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Loamy PDb

The Loamy PDb stratum is located on southeast portion of the property. Loamy PDb is northeast of Sand Creek and occupies NPS land on section 30 T17S R45W. Loamy PDb has an active prairie dog town that continues onto section 29 T17S R45W owned by Burl M. & Catherine R. Scherler.

This area is transitioning from a Blue Grama/Buffalograss Sod Plant Community to a **Red Threawn, Annuals, Bare Ground Plant Community**, a state usually reached through heavy continuous grazing and excessive defoliation. Most dominant grasses from the HCPC were detected below HCPC levels, including western wheatgrass and blue grama at 3.86% ( $\pm$  0.83) and 6.27% ( $\pm$  0.93), respectively. The other dominant grass, green needlegrass, was not detected. The current dominant grass species were detected at 9.40% ( $\pm$  0.90) inland saltgrass, 6.27% ( $\pm$  0.93) blue grama, 4.82% ( $\pm$  0.89) buffalograss, 3.86% ( $\pm$  0.83) western wheatgrass, and 2.17% ( $\pm$  0.67) red threawn. Most dominant forbs from the HCPC were not detected, including American vetch, dotted gayfeather, narrowleaf penstemon, upright prairie coneflower, and purple prairie clover. The other dominant forbs, scarlet globemallow and ironplant goldenweed, were detected above the HCPC levels at 11.33% ( $\pm$  0.78) and 6.75% ( $\pm$  0.94), respectively. The current dominant forb species were detected at a relative abundance of 11.33% ( $\pm$  0.78) scarlet globemallow, 11.08% ( $\pm$  0.80) woolly Indianwheat, 6.99% ( $\pm$  0.94) wallflower, and 6.75% ( $\pm$  0.94) ironplant goldenweed. The dominant shrubs of the HCPC, fourwing saltbush and winterfat, were not detected. Broom snakeweed was the current dominate shrub and was detected at a level twice that of the HCPC at 5.78% ( $\pm$  0.92). Sand sagebrush was detected at a suitable level for the HCPC at 0.24% ( $\pm$  0.24).

The Red Threawn, Annuals, Bare Ground Plant Community is not stable. Nutrient cycling is severely disrupted and erosion is a major concern. This area still contains most of the dominate grasses but has lost most perennial forbs and has a considerable amount of bare ground. Bare ground makes this area at risk for erosion and invasive species. Low litter has also negatively affected energy/nutrient cycling. Although many of the dominant plant species of the HCPC are not found within the Loamy PDb stratum, most of the species are found within the SCMNHS. Species not found on the SCMNHS include: green needlegrass, American vetch, narrowleaf penstemon, fourwing saltbush, and winterfat. However, these species may be present on neighboring lands.



## Loamy PDb

**Site Type:** Rangeland

**Site Name:** Loamy

**Site ID:** R067BY002CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 60

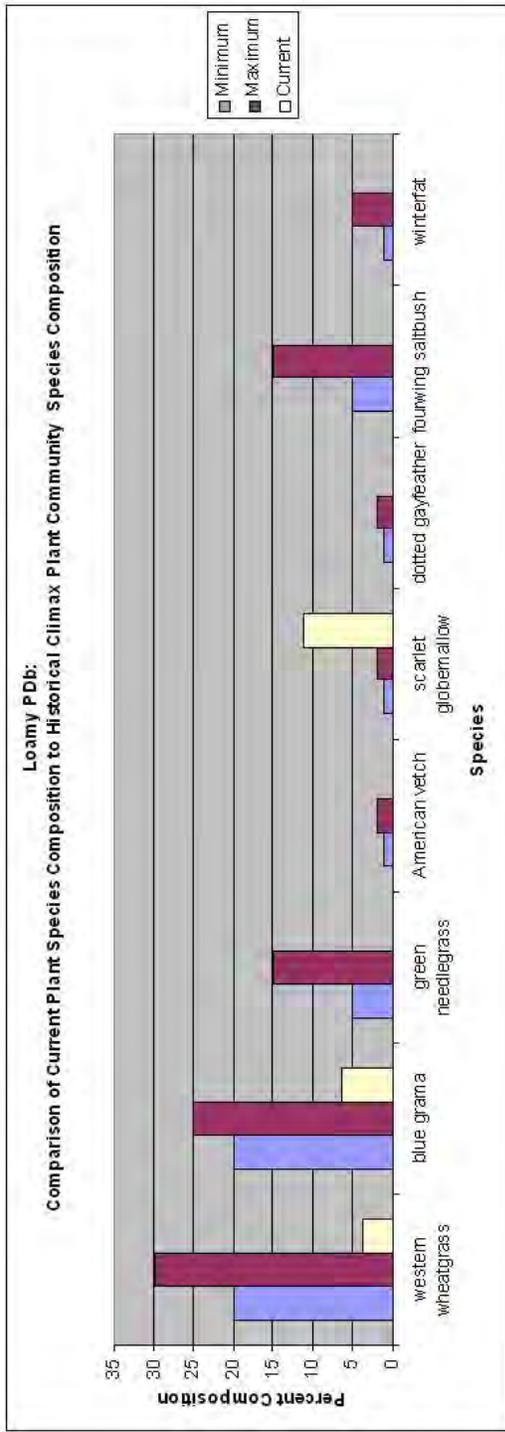
**Date:** June 2005

**Table 3: Loamy PDb Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>				
western wheatgrass	<i>Pascopyrum smithii</i>	20-30	3.86	0.83
blue grama	<i>Bouteloua gracilis</i>	20-25	6.27	0.93
green needlegrass	<i>Nassella viridula</i>	5-15	0.00	0.00
buffalograss	<i>Buchloe dactyloides</i>	1-5	4.82	0.89
sand dropseed	<i>Sporobolus cryptandrus</i>	1-3	0.24	0.24
bottlebrush squirreltail	<i>Elymus elymoides</i>	0-1	0.00	0.00
Indian ricegrass	<i>Achnatherum hymenoides</i>	0-1	0.00	0.00
little bluestem	<i>Schizachyrium scoparium</i>	0-1	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	0-1	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	0-1	2.17	0.67
ring muhly	<i>Muhlenbergia torreyi</i>	0-1	0.00	0.00
sideoats grama	<i>Bouteloua curtipendula</i>	0-1	0.00	0.00
sixweeks fescue	<i>Vulpia octoflora</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
needleleaf sedge	<i>Carex duriuscula</i>	0-1	0.00	0.00
<b>Other native grasses</b>		1-3	9.64	1.14
inland saltgrass	<i>Distichlis spicata</i>		9.40	0.90
tumblegrass	<i>Schedonnardus paniculatus</i>		0.24	0.24
<b>Forbs</b>				
American vetch	<i>Vicia americana</i>	1-5	0.00	0.00
scarlet globemallow	<i>Sphaeralcea coccinea</i>	1-3	11.33	0.78
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
ironplant goldenweed	<i>Haplopappus spinulosus</i>	1-2	6.75	0.94
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	1-2	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	1-2	0.00	0.00
slimflower scurfpea	<i>Psoraleidum tenuiflorum</i>	0-1	0.72	0.41
woolly locoweed	<i>Astragalus mollissimus</i>	0-1	0.00	0.00
silky crazyweed	<i>Oxytropis sericea</i>	0-1	5.54	0.92
silky sophora	<i>Sophora nuttalliana</i>	0-1	0.00	0.00
variable senecio	<i>Packera neomexicana var. mutabilis</i>	0-1	0.00	0.00
plains bahia	<i>Picradeniopsis oppositifolia</i>	0-1	0.00	0.00
Colorado fouroclock	<i>Mirabilis multiflora</i>	0-1	0.00	0.00
cutleaf evening-primrose	<i>Oenothera coronopifolia</i>	0-1	0.00	0.00

Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.00	0.00
rush skeletonplant	<i>Lygodesmia juncea</i>	0-1	0.24	0.24
scarlet gaura	<i>Gaura coccinea</i>	0-1	1.69	0.60
wavyleaf thistle	<i>Cirsium undulatum</i>	0-1	0.48	0.34
western ragweed	<i>Ambrosia psilostachya</i>	0-1	6.02	0.93
woolly Indianwheat	<i>Plantago patagonica</i>	0-1	11.08	0.80
<b>Other native forbs</b>		2-5	22.41	7.77
Astragalus sp.	<i>Astragalus sp.</i>		1.20	0.52
Astragalus sp. #2	<i>Astragalus sp.</i>		0.24	0.24
beggars tick	<i>Cryptantha circumscissa</i>		3.13	0.78
broadleaf milkweed	<i>Asclepias latifolia</i>		0.24	0.24
bush morning glory	<i>Ipomoea leptophylla</i>		0.24	0.24
conyza	<i>Conyza canadensis</i>		1.45	0.56
curlycup gumweed	<i>Grindelia squarrosa</i>		0.48	0.34
flatspine stickseed	<i>Lappula echinata var. occidentalis</i>		1.20	0.52
hairy goldenaster	<i>Heterotheca villosa</i>		0.72	0.41
pepperpod mustard	<i>Lepidium densiflorum</i>		0.72	0.41
prostrate vervain	<i>Verbena bracteata</i>		1.69	0.60
short-ray prairie coneflower	<i>Ratibida tagetes</i>		0.96	0.47
snow on the mountain	<i>Euphorbia marginata</i>		0.24	0.24
stiff flax	<i>Linum rigidum</i>		2.17	0.67
narrowleaf poisonvetch	<i>Astragalus pectinatus</i>		0.48	0.34
wallflower	<i>Erysimum asperum</i>		6.99	0.94
white beardtongue	<i>Penstemon albidus</i>		0.24	0.24
<b>Non native Forbs</b>			0.72	0.41
Russian thistle	<i>Salsola iberica</i>		0.72	0.41
<b>Shrubs</b>				
fourwing saltbush	<i>Atriplex canescens</i>	5-15	0.00	0.00
winterfat	<i>Krascheninnikovia lanata</i>	1-5	0.00	0.00
rubber rabbitbrush	<i>Ericameria nauseosa ssp. nauseosa</i>	0-1	0.00	0.00
broom snakeweed	<i>Gutierrezia sarothrae</i>	0-1	5.78	0.92
fringed sagebrush	<i>Artemisia frigida</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.00	0.00
purple pincushion	<i>Escobaria vivipara var. vivipara</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-3	0.24	0.24
sand sagebrush	<i>Artemisia filifolia</i>		0.24	0.24

<b>Ground Cover</b>	
Type	% Cover
Plant	10.28
Litter	37.78
Bare	51.67
Rock	0.00
n	360



**Figure 10: Loamy PDb Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

## Loamy PDb



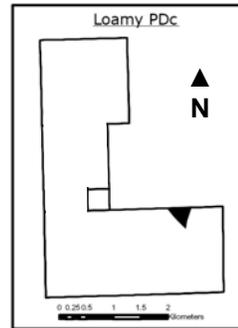
**Figure 11: Photographs of Loamy PDb** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Loamy PDc

The Loamy PDc stratum is located on southeast portion of the property. Loamy PDc is north of Sand Creek and occupies NPS land on section 30 T17S R45W. Loamy PDc has an active prairie dog town.

This area has transitioned to a **Blue Grama/Buffalograss Sod Plant Community**, a state usually reached through continuous grazing. Most dominant grasses from the HCPC were not detected, including western wheatgrass and green needlegrass. The other dominant grass, blue grama, was detected at the HCPC level, 20.88% ( $\pm 0.62$ ). The current dominant grass species were detected at 21.61% ( $\pm 0.37$ ) buffalograss, 20.88% ( $\pm 0.62$ ) blue grama, 1.83% ( $\pm 0.79$ ) red threeawn, 1.10% ( $\pm 0.62$ ) ring muhly, and 1.10% ( $\pm 0.62$ ) tumblegrass. Most dominant forbs from the HCPC were not detected, including American vetch, dotted gayfeather, narrowleaf penstemon, upright prairie coneflower, and purple prairie clover. The other dominant forbs, scarlet globemallow and ironplant goldenweed, were detected at 5.86% ( $\pm 1.27$ ) and 0.37% ( $\pm 0.37$ ), respectively. The current dominant forb species were detected at a relative abundance of 17.95% ( $\pm 1.11$ ) stiff flax, 13.19% ( $\pm 1.40$ ) woolly Indianwheat, 5.86% ( $\pm 1.27$ ) scarlet globemallow, and 4.03% ( $\pm 1.11$ ) western ragweed. The dominant shrubs of the HCPC, fourwing saltbush and winterfat, were not detected. Broom snakeweed was detected at a suitable level for the HCPC at 1.10% ( $\pm 0.62$ ).

Much of the diversity and production of HCPC has been lost with the cool season grasses, shrubs, and nitrogen fixing forbs. This has negatively affected energy/nutrient cycling and a shallow "root pan" of blue grama/buffalograss sod has greatly reduced infiltration. The Blue Grama/Buffalograss Sod Plant Community is usually resistant to change to change due to the grazing tolerance of blue grama and buffalograss. This tolerance assumes ungulate grazing but this area of the SCMNHs is primarily grazed by prairie dogs that graze for food and visibility. This makes the blue grama/buffalograss sod vulnerable and in turn makes erosion a concern. Although many of the dominant plant species of the HCPC are not found within the Loamy PDc stratum, most of the species are found within the SCMNHs. Species not found on the SCMNHs include: green needlegrass, American vetch, narrowleaf penstemon, fourwing saltbush, and winterfat. However, these species may be present on neighboring lands.



## Loamy PDC

**Site Type:** Rangeland

**Site Name:** Loamy

**Site ID:** R067BY002CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 60

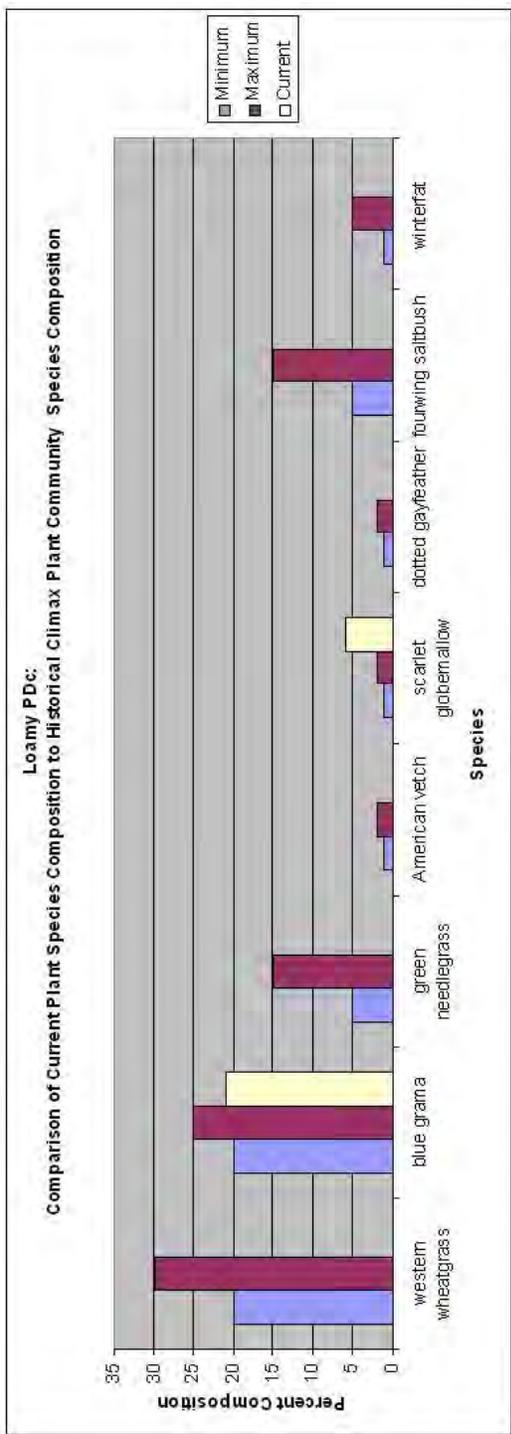
**Date:** June 2005

**Table 4: Loamy PDC Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>				
western wheatgrass	<i>Pascopyrum smithii</i>	20-30	0.00	0.00
blue grama	<i>Bouteloua gracilis</i>	20-25	20.88	0.62
green needlegrass	<i>Nassella viridula</i>	5-15	0.00	0.00
buffalograss	<i>Buchloe dactyloides</i>	1-5	21.61	0.37
sand dropseed	<i>Sporobolus cryptandrus</i>	1-3	0.37	0.37
bottlebrush squirreltail	<i>Elymus elymoides</i>	0-1	0.00	0.00
Indian ricegrass	<i>Achnatherum hymenoides</i>	0-1	0.00	0.00
little bluestem	<i>Schizachyrium scoparium</i>	0-1	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	0-1	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	0-1	1.83	0.79
ring muhly	<i>Muhlenbergia torreyi</i>	0-1	1.10	0.62
sideoats grama	<i>Bouteloua curtipendula</i>	0-1	0.00	0.00
sixweeks fescue	<i>Vulpia octoflora</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
needleleaf sedge	<i>Carex duriuscula</i>	0-1	0.00	0.00
<b>Other native grasses</b>		1-3	1.10	0.62
tumblegrass	<i>Schedonnardus paniculatus</i>		1.10	0.62
<b>Forbs</b>				
American vetch	<i>Vicia americana</i>	1-5	0.00	0.00
scarlet globemallow	<i>Sphaeralcea coccinea</i>	1-3	5.86	1.27
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
ironplant goldenweed	<i>Haplopappus spinulosus</i>	1-2	0.37	0.37
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	1-2	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	1-2	0.00	0.00
slimflower scurfpea	<i>Psoralidium tenuiflorum</i>	0-1	3.66	1.07
woolly locoweed	<i>Astragalus mollissimus</i>	0-1	0.00	0.00
silky crazyweed	<i>Oxytropis sericea</i>	0-1	0.00	0.00
silky sophora	<i>Sophora nuttalliana</i>	0-1	0.00	0.00
variable senecio	<i>Packera neomexicana var. mutabilis</i>	0-1	0.00	0.00
plains bahia	<i>Picradeniopsis oppositifolia</i>	0-1	0.00	0.00
Colorado fouroclock	<i>Mirabilis multiflora</i>	0-1	0.00	0.00
cutleaf evening-primrose	<i>Oenothera coronopifolia</i>	0-1	0.00	0.00
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.00	0.00

rush skeletonplant	<i>Lygodesmia juncea</i>	0-1	1.10	0.62
scarlet gaura	<i>Gaura coccinea</i>	0-1	2.20	0.86
wavyleaf thistle	<i>Cirsium undulatum</i>	0-1	0.00	0.00
western ragweed	<i>Ambrosia psilostachya</i>	0-1	4.03	1.11
woolly Indianwheat	<i>Plantago patagonica</i>	0-1	13.19	1.40
<b>Other native forbs</b>		2-5	20.88	3.09
Astragalus sp. #2	<i>Astragalus sp.</i>		1.10	0.62
Missouri milkvetch	<i>Astragalus missouriensis</i>		0.37	0.37
prostrate vervain	<i>Verbena bracteata</i>		0.37	0.37
stiff flax	<i>Linum rigidum</i>		17.95	1.11
narrowleaf poisonvetch	<i>Astragalus pectinatus</i>		0.00	0.00
wallflower	<i>Erysimum asperum</i>		1.10	0.62
<b>Unidentified forbs</b>				
UF99	<i>Brassicaceae</i>		0.73	0.51
<b>Shrubs</b>				
fourwing saltbush	<i>Atriplex canescens</i>	5-15	0.00	0.00
winterfat	<i>Krascheninnikovia lanata</i>	1-5	0.00	0.00
rubber rabbitbrush	<i>Ericameria nauseosa ssp. nauseosa</i>	0-1	0.00	0.00
broom snakeweed	<i>Gutierrezia sarothrae</i>	0-1	1.10	0.62
fringed sagebrush	<i>Artemisia frigida</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.00	0.00
purple pincushion	<i>Escobaria vivipara var. vivipara</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-3	0.00	0.00

<b>Ground Cover</b>	
Type	% Cover
Plant	40.00
Litter	33.33
Bare	26.39
Rock	0.28
n	360



**Figure 12: Loamy PDC Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

## Loamy PDc



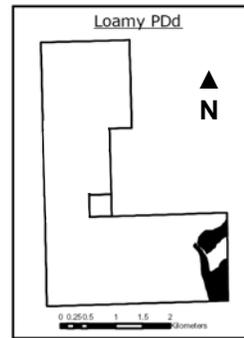
**Figure 13: Photographs of Loamy PDc** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Loamy PDd

The Loamy PDd stratum is located on southeast portion of the property. Loamy PDd is east of Sand Creek and occupies NPS land on section 30 T17S R45W. Loamy PDd has an active prairie dog town that continues onto section 29 T17S R45W owned by Burl M. & Catherine R. Scherler.

This area is transitioning from a Blue Grama/Buffalograss Sod Plant Community to a **Red Threawn, Annuals, Bare Ground Plant Community** a state usually reached through heavy continuous grazing and excessive defoliation. Most dominant grasses from the HCPC were detected below HCPC levels, including western wheatgrass and blue grama at 0.26% ( $\pm 0.18$ ) and 11.15% ( $\pm 0.47$ ), respectively. The other dominant grass, green needlegrass, was not detected. The current dominant grass species were detected at 12.73% ( $\pm 0.22$ ) red threawn, 11.15% ( $\pm 0.47$ ) blue grama, and 11.02% ( $\pm 0.89$ ) buffalograss. Most dominant forbs from the HCPC were not detected, including American vetch, dotted gayfeather, narrowleaf penstemon, upright prairie coneflower, and purple prairie clover. The other dominant forbs, scarlet globemallow and ironplant goldenweed, were detected at 4.86% ( $\pm 0.64$ ) and 1.57% ( $\pm 0.43$ ), respectively. The current dominant forb species were detected at a relative abundance of 12.86% ( $\pm 0.18$ ) woolly Indianwheat, 9.19% ( $\pm 0.60$ ) stiff flax, 6.17% ( $\pm 0.66$ ) wallflower, and 4.99% ( $\pm 0.64$ ) slimflower scurfpea. The dominant shrubs of the HCPC, fourwing saltbush and winterfat, were not detected. Broom snakeweed, sand sagebrush, and green rabbitbrush were detected at suitable levels for the HCPC at 1.31% ( $\pm 0.40$ ), 0.52% ( $\pm 0.26$ ), 0.39% ( $\pm 0.22$ ), respectively.

The Red Threawn, Annuals, Bare Ground Plant Community is not stable. Nutrient cycling is severely disrupted and erosion is a major concern. This area still contains most of the dominate grasses but has lost most perennial forbs and has a considerable amount of bare ground. Bare ground makes this area at risk for erosion and invasive species. Low litter has also negatively affected energy/nutrient cycling. Although many of the dominant plant species of the HCPC are not found within the Loamy PDd stratum, most of the species are found within the SCMNHs. Species not found on the SCMNHs include: green needlegrass, American vetch, narrowleaf penstemon, fourwing saltbush, and winterfat. However, these species may be present on neighboring lands.



## Loamy PDD

**Site Type:** Rangeland

**Site Name:** Loamy

**Site ID:** R067BY002CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 100

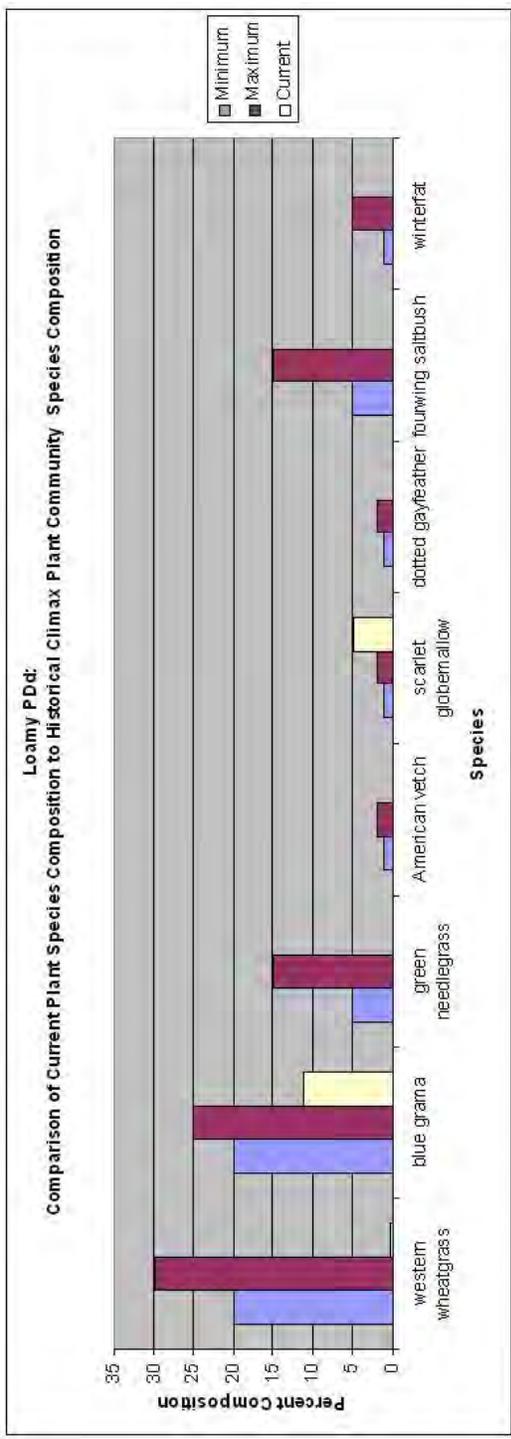
**Date:** June 2005

**Table 5: Loamy PDD Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>				
western wheatgrass	<i>Pascopyrum smithii</i>	20-30	0.26	0.18
blue grama	<i>Bouteloua gracilis</i>	20-25	11.15	0.47
green needlegrass	<i>Nassella viridula</i>	5-15	0.00	0.00
buffalograss	<i>Buchloe dactyloides</i>	1-5	11.02	0.48
sand dropseed	<i>Sporobolus cryptandrus</i>	1-3	0.66	0.29
bottlebrush squirreltail	<i>Elymus elymoides</i>	0-1	0.39	0.22
Indian ricegrass	<i>Achnatherum hymenoides</i>	0-1	0.00	0.00
little bluestem	<i>Schizachyrium scoparium</i>	0-1	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	0-1	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	0-1	12.73	0.22
ring muhly	<i>Muhlenbergia torreyi</i>	0-1	0.00	0.00
sideoats grama	<i>Bouteloua curtipendula</i>	0-1	0.00	0.00
sixweeks fescue	<i>Vulpia octoflora</i>	0-1	0.26	0.18
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
needleleaf sedge	<i>Carex duriuscula</i>	0-1	0.00	0.00
<b>Other native grasses</b>		1-3	1.31	0.56
inland saltgrass	<i>Distichlis spicata</i>		0.39	0.22
tumblegrass	<i>Schedonnardus paniculatus</i>		0.92	0.34
<b>Forbs</b>				
American vetch	<i>Vicia americana</i>	1-5	0.00	0.00
scarlet globemallow	<i>Sphaeralcea coccinea</i>	1-3	4.86	0.64
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
ironplant goldenweed	<i>Haplopappus spinulosus</i>	1-2	1.57	0.43
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	1-2	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	1-2	0.00	0.00
slimflower scurfpea	<i>Psoralidium tenuiflorum</i>	0-1	4.99	0.64
woolly locoweed	<i>Astragalus mollissimus</i>	0-1	1.31	0.40
silky crazyweed	<i>Oxytropis sericea</i>	0-1	0.66	0.29
silky sophora	<i>Sophora nuttalliana</i>	0-1	0.00	0.00
variable senecio	<i>Packera neomexicana var. mutabilis</i>	0-1	0.00	0.00
plains bahia	<i>Picradeniopsis oppositifolia</i>	0-1	0.00	0.00
Colorado fourclock	<i>Mirabilis multiflora</i>	0-1	0.00	0.00
cutleaf evening-primrose	<i>Oenothera coronopifolia</i>	0-1	0.00	0.00

Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.00	0.00
rush skeletonplant	<i>Lygodesmia juncea</i>	0-1	0.66	0.29
scarlet gaura	<i>Gaura coccinea</i>	0-1	1.57	0.43
wavyleaf thistle	<i>Cirsium undulatum</i>	0-1	1.44	0.41
western ragweed	<i>Ambrosia psilostachya</i>	0-1	3.67	0.59
woolly Indianwheat	<i>Plantago patagonica</i>	0-1	12.86	0.18
<b>Other native forbs</b>		2-5	23.88	4.38
beggars tick	<i>Cryptantha circumscissa</i>		1.44	0.41
conyza	<i>Conyza canadensis</i>		3.28	0.57
curlycup gumweed	<i>Grindelia squarrosa</i>		0.13	0.13
evening-primrose	<i>Oenothera spp.</i>		0.26	0.18
flatspine stickseed	<i>Lappula echinata var. occidentalis</i>		0.13	0.13
groundplum milkvetch	<i>Astragalus crassicaarpus</i>		1.05	0.36
Hymenopappus sp.	<i>Hymenopappus sp.</i>		0.26	0.18
James rushpea	<i>Caesalpinia jamesii</i>		0.13	0.13
Missouri milkvetch	<i>Astragalus missouriensis</i>		0.39	0.22
Nuttalls evolulus	<i>Evolvulus nuttallianus</i>		0.13	0.13
prostrate vervain	<i>Verbena bracteata</i>		0.26	0.18
stiff flax	<i>Linum rigidum</i>		9.19	0.60
velvet gaura	<i>Gaura parviflora</i>		0.13	0.13
wallflower	<i>Erysimum asperum</i>		6.17	0.66
winecup	<i>Callirhoe involucrata</i>		0.92	0.34
<b>Non native forbs</b>		0	1.31	0.56
kochia	<i>Kochia scoparia</i>		0.39	0.22
Russian thistle	<i>Salsola iberica</i>		0.92	0.34
<b>Unidentified forbs</b>				
UF99	<i>Brassicaceae</i>		1.18	0.38
<b>Shrubs</b>				
fourwing saltbush	<i>Atriplex canescens</i>	5-15	0.00	0.00
winterfat	<i>Krascheninnikovia lanata</i>	1-5	0.00	0.00
rubber rabbitbrush	<i>Ericameria nauseosa ssp. nauseosa</i>	0-1	0.00	0.00
broom snakeweed	<i>Gutierrezia sarothrae</i>	0-1	1.31	0.40
fringed sagebrush	<i>Artemisia frigida</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.00	0.00
purple pincushion	<i>Escobaria vivipara var. vivipara</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-3	0.92	0.48
green rabbitbrush	<i>Chrysothamnus visidiflorus</i>		0.39	0.22
sand sagebrush	<i>Artemisia filifolia</i>		0.52	0.26

Ground Cover	
Type	% Cover
Plant	28.00
Litter	33.83
Bare	38.17
Rock	0.00
n	600



**Figure 14: Loamy P Dd Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

### Loamy PDd



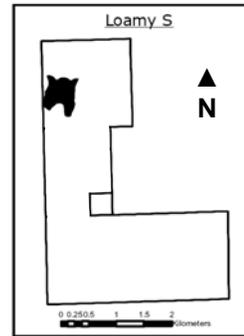
**Figure 15: Photographs of Loamy PDd** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Loamy S

The Loamy S stratum is located on northern portion of the property. Loamy S is northeast of Sand Creek and occupies NPS land on section 13 T17S R46W. This stratum has an active prairie dog town.

This area has transitioned to a **Blue Grama/Buffalograss Sod: Broom Snakeweed Plant Community**, a state usually reached through continuous grazing. Most dominant grasses from the HCPC were not detected, including western wheatgrass and green needlegrass. The other dominant grass, blue grama, was detected below the HCPC level at 4.91% ( $\pm 1.06$ ). The current dominant grass species were detected at 12.88% ( $\pm 1.10$ ) sand dropseed, 11.96% ( $\pm 1.14$ ) buffalograss, 10.12% ( $\pm 1.19$ ) bottlebrush squirreltail, and 4.91% ( $\pm 1.06$ ) blue grama. Most dominant forbs from the HCPC were not detected, including American vetch, dotted gayfeather, narrowleaf penstemon, upright prairie coneflower, and purple prairie clover. The other dominant forbs, scarlet globemallow and ironplant goldenweed, were detected at 8.28% ( $\pm 1.19$ ) and 1.53% ( $\pm 0.66$ ), respectively. The current dominant forb species were detected at a relative abundance of 13.80% ( $\pm 1.04$ ) yellow sweetclover, 8.28% ( $\pm 1.19$ ) scarlet globemallow, 7.06% ( $\pm 1.16$ ) rush skeletonplant, and 7.06% ( $\pm 1.16$ ) Russian thistle. The dominant shrubs of the HCPC, fourwing saltbush and winterfat, were not detected. Sand sagebrush and plains pricklypear were detected at suitable levels for the HCPC at 0.92% ( $\pm 0.52$ ) and 0.31% ( $\pm 0.31$ ), respectively.

Much of the diversity and production of HCPC has been lost with the cool season grasses and shrubs. This has negatively affected energy/nutrient cycling and a shallow "root pan" of blue grama/buffalograss sod has greatly reduced infiltration. The Blue Grama/Buffalograss Sod Plant Community is usually resistant to change to change due to the grazing tolerance of blue grama and buffalograss. This tolerance assumes ungulate grazing but this area of the SCMNHS is primarily grazed by prairie dogs that graze for food and visibility. This makes the blue grama/buffalograss sod vulnerable and in turn makes erosion a concern. Although many of the dominant plant species of the HCPC are not found within the Loamy S stratum, most of the species are found within the SCMNHS. Species not found on the SCMNHS include: green needlegrass, American vetch, narrowleaf penstemon, fourwing saltbush, and winterfat. However, these species may be present on neighboring lands.



## Loamy S

**Site Type:** Rangeland

**Site Name:** Loamy

**Site ID:** R067BY002CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 60

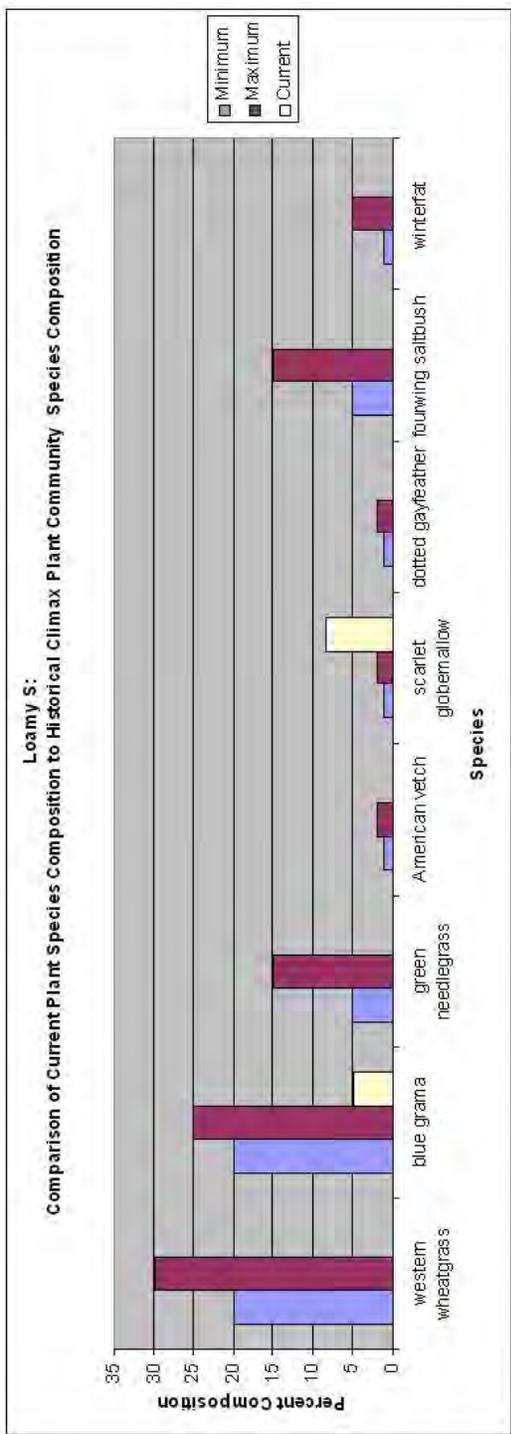
**Date:** June 2005

**Table 6: Loamy S Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>				
western wheatgrass	<i>Pascopyrum smithii</i>	20-30	0.00	0.00
blue grama	<i>Bouteloua gracilis</i>	20-25	4.91	1.06
green needlegrass	<i>Nassella viridula</i>	5-15	0.00	0.00
buffalograss	<i>Buchloe dactyloides</i>	1-5	11.96	1.14
sand dropseed	<i>Sporobolus cryptandrus</i>	1-3	12.88	1.10
bottlebrush squirreltail	<i>Elymus elymoides</i>	0-1	10.12	1.19
Indian ricegrass	<i>Achnatherum hymenoides</i>	0-1	0.00	0.00
little bluestem	<i>Schizachyrium scoparium</i>	0-1	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	0-1	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	0-1	3.99	0.99
ring muhly	<i>Muhlenbergia torreyi</i>	0-1	0.00	0.00
sideoats grama	<i>Bouteloua curtipendula</i>	0-1	0.00	0.00
sixweeks fescue	<i>Vulpia octoflora</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
needleleaf sedge	<i>Carex duriuscula</i>	0-1	0.00	0.00
<b>Other native grasses</b>		1-3	2.76	1.26
prairie threeawn	<i>Aristida oligantha</i>		1.53	0.66
tumblegrass	<i>Schedonnardus paniculatus</i>		1.23	0.60
<b>Forbs</b>				
American vetch	<i>Vicia americana</i>	1-5	0.00	0.00
scarlet globemallow	<i>Sphaeralcea coccinea</i>	1-3	8.28	1.19
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
ironplant goldenweed	<i>Haplopappus spinulosus</i>	1-2	1.53	0.66
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	1-2	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	1-2	0.00	0.00
slimflower scurfpea	<i>Psoraleidum tenuiflorum</i>	0-1	0.92	0.52
woolly locoweed	<i>Astragalus mollissimus</i>	0-1	0.31	0.31
silky crazyweed	<i>Oxytropis sericea</i>	0-1	0.00	0.00
silky sophora	<i>Sophora nuttalliana</i>	0-1	0.00	0.00
variable senecio	<i>Packera neomexicana var. mutabilis</i>	0-1	0.00	0.00
plains bahia	<i>Picradeniopsis oppositifolia</i>	0-1	0.00	0.00
Colorado fourclock	<i>Mirabilis multiflora</i>	0-1	0.00	0.00
cutleaf evening-primrose	<i>Oenothera coronopifolia</i>	0-1	0.00	0.00

Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.00	0.00
rush skeletonplant	<i>Lygodesmia juncea</i>	0-1	7.06	1.16
scarlet gaura	<i>Gaura coccinea</i>	0-1	0.00	0.00
wavyleaf thistle	<i>Cirsium undulatum</i>	0-1	0.92	0.52
western ragweed	<i>Ambrosia psilostachya</i>	0-1	0.92	0.52
woolly Indianwheat	<i>Plantago patagonica</i>	0-1	0.00	0.00
<b>Other native forbs</b>		2-5	11.35	5.49
conyza	<i>Conyza canadensis</i>		1.23	0.60
curlycup gumweed	<i>Grindelia squarrosa</i>		0.61	0.43
flatspine stickseed	<i>Lappula echinata var. occidentalis</i>		0.31	0.31
heath aster	<i>Symphyotrichum ericoides</i>		0.61	0.43
Hymenopappus sp.	<i>Hymenopappus sp.</i>		1.53	0.66
Linum sp.	<i>Linum sp.</i>		1.23	0.60
Missouri milkvetch	<i>Astragalus missouriensis</i>		0.61	0.43
short-ray prairie coneflower	<i>Ratibida tagetes</i>		0.31	0.31
stiff flax	<i>Linum rigidum</i>		3.99	0.99
wallflower	<i>Erysimum asperum</i>		0.31	0.31
white prairie clover	<i>Dalea candida</i>		0.61	0.43
<b>Non native forbs</b>		0	20.86	2.20
Russian thistle	<i>Salsola iberica</i>		7.06	1.16
yellow sweetclover	<i>Melilotus officinalis</i>		13.80	1.04
<b>Shrubs</b>				
fourwing saltbush	<i>Atriplex canescens</i>	5-15	0.00	0.00
winterfat	<i>Krascheninnikovia lanata</i>	1-5	0.00	0.00
rubber rabbitbrush	<i>Ericameria nauseosa ssp. nauseosa</i>	0-1	0.00	0.00
broom snakeweed	<i>Gutierrezia sarothrae</i>	0-1	0.00	0.00
fringed sagebrush	<i>Artemisia frigida</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.31	0.31
purple pincushion	<i>Escobaria vivipara var. vivipara</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-3	0.92	0.52
sand sagebrush	<i>Artemisia filifolia</i>		0.92	0.52

<b>Ground Cover</b>	
Type	% Cover
Plant	40.28
Litter	38.33
Bare	21.39
Rock	0.00
n	360



**Figure 16: Loamy S Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

## Loamy S

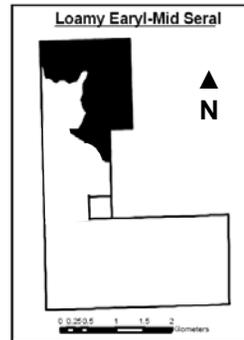


**Figure 17: Photographs of Loamy S** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Loamy Early-Mid Seral

This area has transitioned to a **Blue Grama/Buffalograss Sod Plant Community**, a state usually reached through continuous grazing. Most dominant grasses from the HCPC were not detected, including western wheatgrass and green needlegrass. The other dominant grass, blue grama, was detected at HCPC level at 24.57% ( $\pm 0.42$ ). The current dominant grass species were detected at 24.57% ( $\pm 0.42$ ) blue grama, 11.78% ( $\pm 0.96$ ) sand dropseed, 5.75% ( $\pm 0.80$ ) sideoats grama, 5.03% ( $\pm 0.77$ ) and buffalograss. Many dominant forbs from the HCPC were not detected, including American vetch, dotted gayfeather, narrowleaf penstemon, upright prairie coneflower, and purple prairie clover. The other dominant forbs were detected at 11.78% ( $\pm 0.96$ ) scarlet globemallow (four times the HCPC level) and 0.43% ( $\pm 0.25$ ) ironplant goldenweed. The current dominant forb species were detected at a relative abundance of 11.78% ( $\pm 0.96$ ) scarlet globemallow, 7.61% ( $\pm 0.88$ ) stiff flax, 6.90% ( $\pm 0.85$ ) rush skeletonplant, and 6.61% ( $\pm 0.84$ ) Russian thistle. The dominant shrubs of the HCPC, fourwing saltbush and winterfat, were not detected. Plains pricklypear and green rabbitbrush were detected at suitable levels for the HCPC at 0.14% ( $\pm 0.14$ ) and 0.14% ( $\pm 0.14$ ), respectively.

Much of the diversity and production of HCPC has been lost with the cool season grasses, shrubs, and nitrogen fixing forbs. This has negatively affected energy/nutrient cycling and a shallow "root pan" of blue grama/buffalograss sod has greatly reduced infiltration. The Blue Grama/Buffalograss Sod Plant Community is resistant to change due to the grazing tolerance of blue grama and buffalograss. Although many of the dominant plant species of the HCPC are not found within the Loamy Early-Mid Seral stratum, most of the species are found within the SCMNHs. Species not found on the SCMNHs include: green needlegrass, American vetch, narrowleaf penstemon, fourwing saltbush, and winterfat. However, these species may be present on neighboring lands.



## Loamy Early-Mid Seral

**Site Type:** Rangeland

**Site Name:** Loamy

**Site ID:** R067BY002CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 180

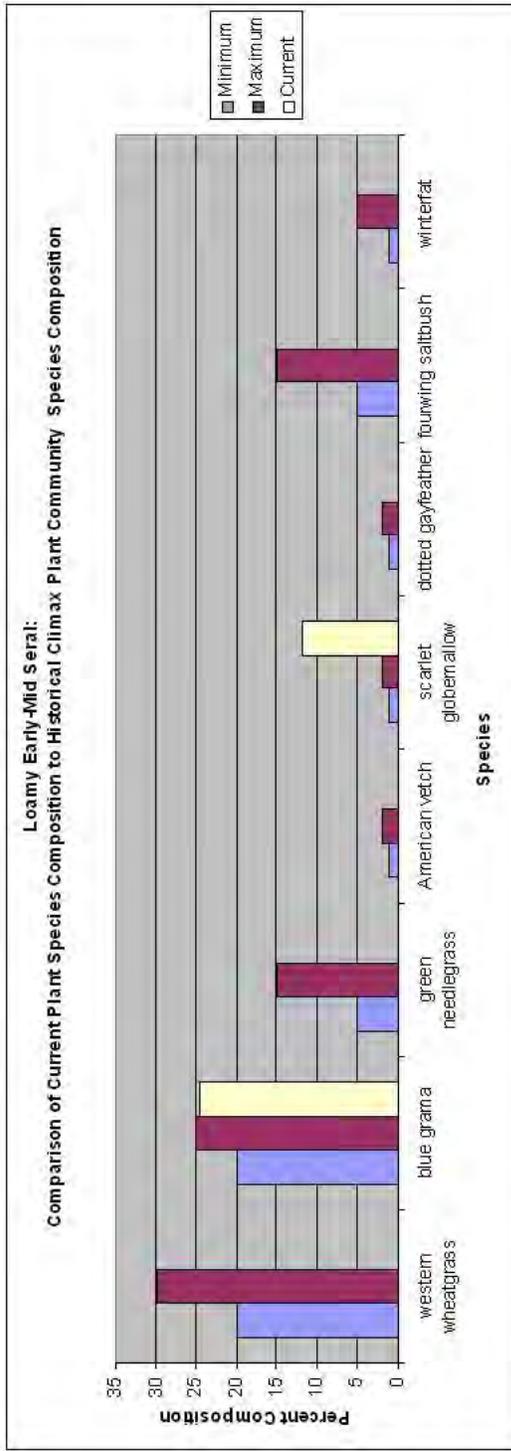
**Date:** June 2005

**Table 7: Loamy Early-Mid Seral Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>				
western wheatgrass	<i>Pascopyrum smithii</i>	20-30	0.00	0.00
blue grama	<i>Bouteloua gracilis</i>	20-25	24.57	0.42
green needlegrass	<i>Nassella viridula</i>	5-15	0.00	0.00
buffalograss	<i>Buchloe dactyloides</i>	1-5	5.03	0.77
sand dropseed	<i>Sporobolus cryptandrus</i>	1-3	11.78	0.96
bottlebrush squirreltail	<i>Elymus elymoides</i>	0-1	1.87	0.50
Indian ricegrass	<i>Achnatherum hymenoides</i>	0-1	0.00	0.00
little bluestem	<i>Schizachyrium scoparium</i>	0-1	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	0-1	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	0-1	0.29	0.20
ring muhly	<i>Muhlenbergia torreyi</i>	0-1	0.00	0.00
sideoats grama	<i>Bouteloua curtipendula</i>	0-1	5.75	0.80
sixweeks fescue	<i>Vulpia octoflora</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
needleleaf sedge	<i>Carex duriuscula</i>	0-1	0.00	0.00
<b>Other native grasses</b>		1-3	2.01	0.71
hairy grama	<i>Bouteloua hirsuta</i>		0.43	0.25
tumblegrass	<i>Schedonnardus paniculatus</i>		1.58	0.46
<b>Forbs</b>				
American vetch	<i>Vicia americana</i>	1-5	0.00	0.00
scarlet globemallow	<i>Sphaeralcea coccinea</i>	1-3	11.78	0.96
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
ironplant goldenweed	<i>Haplopappus spinulosus</i>	1-2	0.43	0.25
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	1-2	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	1-2	0.00	0.00
slimflower scurfpea	<i>Psoralidium tenuiflorum</i>	0-1	1.29	0.42
woolly locoweed	<i>Astragalus mollissimus</i>	0-1	0.00	0.00
silky crazyweed	<i>Oxytropis sericea</i>	0-1	0.00	0.00
silky sophora	<i>Sophora nuttalliana</i>	0-1	0.00	0.00
variable senecio	<i>Packera neomexicana var. mutabilis</i>	0-1	0.00	0.00
plains bahia	<i>Picradeniopsis oppositifolia</i>	0-1	0.00	0.00
Colorado fourclock	<i>Mirabilis multiflora</i>	0-1	0.00	0.00
cutleaf evening-primrose	<i>Oenothera coronopifolia</i>	0-1	0.00	0.00

Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.00	0.00
rush skeletonplant	<i>Lygodesmia juncea</i>	0-1	6.90	0.85
scarlet gaura	<i>Gaura coccinea</i>	0-1	1.15	0.40
wavyleaf thistle	<i>Cirsium undulatum</i>	0-1	0.14	0.14
western ragweed	<i>Ambrosia psilostachya</i>	0-1	0.00	0.00
woolly Indianwheat	<i>Plantago patagonica</i>	0-1	0.43	0.25
<b>Other native forbs</b>		2-5	17.10	4.48
beggars tick	<i>Cryptantha circumscissa</i>		0.14	0.14
blanket flower	<i>Gaillardia pulchella</i>		0.29	0.20
conyza	<i>Conyza canadensis</i>		2.30	0.55
curlycup gumweed	<i>Grindelia squarrosa</i>		0.29	0.20
evening-primrose	<i>Oenothera spp.</i>		0.29	0.20
flatspine stickseed	<i>Lappula echinata var. occidentalis</i>		2.44	0.57
groundsel	<i>Senecio integerrimus</i>		0.14	0.14
heath aster	<i>Symphyotrichum ericoides</i>		0.14	0.14
Hymenopappus sp.	<i>Hymenopappus sp.</i>		0.14	0.14
Missouri milkvetch	<i>Astragalus missouriensis</i>		1.44	0.44
pepperpod mustard	<i>Lepidium densiflorum</i>		0.29	0.20
stiff flax	<i>Linum rigidum</i>		7.61	0.88
narrowleaf poisonvetch	<i>Astragalus pectinatus</i>		1.01	0.37
wallflower	<i>Erysimum asperum</i>		0.57	0.28
<b>Non native forbs</b>		0	9.20	1.62
kochia	<i>Kochia scoparia</i>		2.16	0.53
Russian thistle	<i>Salsola iberica</i>		6.61	0.84
yellow sweetclover	<i>Melilotus officinalis</i>		0.43	0.25
<b>Shrubs</b>				
fourwing saltbush	<i>Atriplex canescens</i>	5-15	0.00	0.00
winterfat	<i>Krascheninnikovia lanata</i>	1-5	0.00	0.00
rubber rabbitbrush	<i>Ericameria nauseosa ssp. nauseosa</i>	0-1	0.00	0.00
broom snakeweed	<i>Gutierrezia sarothrae</i>	0-1	0.00	0.00
fringed sagebrush	<i>Artemisia frigida</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.14	0.14
purple pincushion	<i>Escobaria vivipara var. vivipara</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-3	0.14	0.14
green rabbitbrush	<i>Chrysothamnus visidiflorus</i>		0.14	0.14

<b>Ground Cover</b>	
Type	% Cover
Plant	43.85
Litter	31.67
Bare	24.48
Rock	0.00
n	1080



**Figure 18: Loamy Early-Mid Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

### Loamy Early-Mid Seral



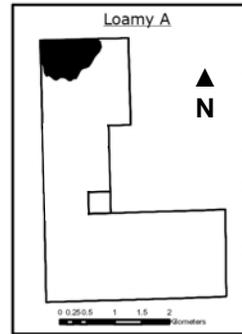
**Figure 19: Photographs of Loamy Early-Mid Seral** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Loamy A

The Loamy A stratum is located on north portion of the property. Loamy A is northeast of Sand Creek and occupies NPS land on section 13 T17S R46W.

This area has transitioned to a **Blue Grama/Buffalograss Sod Plant Community**, a state usually reached through continuous grazing. Most dominant grasses from the HCPC were not detected, including western wheatgrass and green needlegrass. The other dominant grass, blue grama, was detected at the HCPC level, 24.89% ( $\pm 0.74$ ). The current dominant grass species were detected at 24.89% ( $\pm 0.74$ ) blue grama, 17.90% ( $\pm 1.59$ ) sand dropseed, 4.37% ( $\pm 1.27$ ) sideoats grama, and 2.26% ( $\pm 1.02$ ) bottlebrush squirreltail. Most dominant forbs from the HCPC were not detected, including American vetch, dotted gayfeather, narrowleaf penstemon, upright prairie coneflower, and purple prairie clover. The other dominant forbs, scarlet globemallow and ironplant goldenweed, were detected at 15.28% ( $\pm 1.68$ ) (five times the HCPC level) and 0.44% ( $\pm 0.44$ ), respectively. The current dominant forb species were mostly annuals and were detected at a relative abundance of 15.28% ( $\pm 1.68$ ) scarlet globemallow, 15.28% ( $\pm 1.68$ ) Russian thistle, 4.37% ( $\pm 1.27$ ) blue stickseed, and 4.37% ( $\pm 1.27$ ) kochia. The dominant shrubs of the HCPC, fourwing saltbush and winterfat, were not detected. Plains pricklypear was the only shrub, detected at 0.44% ( $\pm 0.44$ ), a suitable abundance in the HCPC.

Much of the diversity and production of HCPC has been lost with the cool season grasses, shrubs, and nitrogen fixing forbs. This has negatively affected energy/nutrient cycling and a shallow "root pan" of blue grama/buffalograss sod has greatly reduced infiltration. The Blue Grama/Buffalograss Sod Plant Community is resistant to change to change due to the grazing tolerance of blue grama and buffalograss. This area has a high abundance of annual forbs. Although many of the dominant plant species of the HCPC are not found within the Loamy A stratum, most of the species are found within the SCMNHs. Species not found on the SCMNHs include: green needlegrass, American vetch, narrowleaf penstemon, fourwing saltbush, and winterfat. However, these species may be present on neighboring lands.



## Loamy A

**Site Type:** Rangeland

**Site Name:** Loamy

**Site ID:** R067BY002CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 60

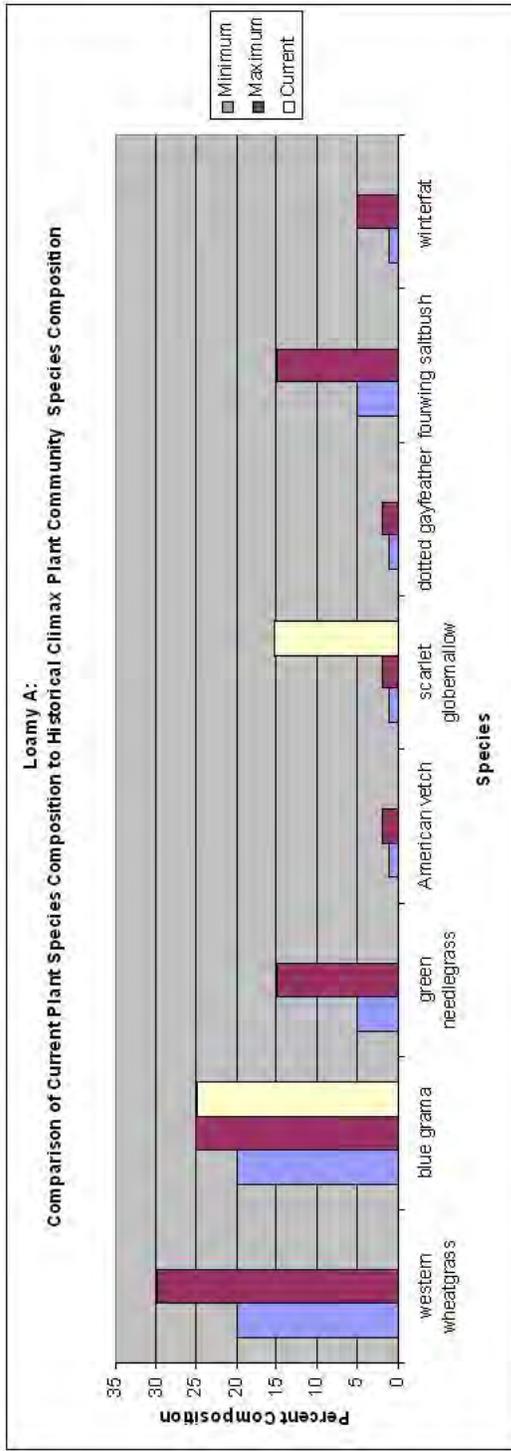
**Date:** June 2005

**Table 8: Loamy A Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>				
western wheatgrass	<i>Pascopyrum smithii</i>	20-30	0.00	0.00
blue grama	<i>Bouteloua gracilis</i>	20-25	24.89	0.74
green needlegrass	<i>Nassella viridula</i>	5-15	0.00	0.00
buffalograss	<i>Buchloe dactyloides</i>	1-5	0.44	0.44
sand dropseed	<i>Sporobolus cryptandrus</i>	1-3	17.90	1.59
bottlebrush squirreltail	<i>Elymus elymoides</i>	0-1	2.62	1.02
Indian ricegrass	<i>Achnatherum hymenoides</i>	0-1	0.00	0.00
little bluestem	<i>Schizachyrium scoparium</i>	0-1	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	0-1	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	0-1	0.00	0.00
ring muhly	<i>Muhlenbergia torreyi</i>	0-1	0.00	0.00
sideoats grama	<i>Bouteloua curtipendula</i>	0-1	4.37	1.27
sixweeks fescue	<i>Vulpia octoflora</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
needleleaf sedge	<i>Carex duriuscula</i>	0-1	0.00	0.00
<b>Other native grasses</b>		1-3	0.44	0.44
tumblegrass	<i>Schedonnardus paniculatus</i>		0.44	0.44
<b>Forbs</b>				
American vetch	<i>Vicia americana</i>	1-5	0.00	0.00
scarlet globemallow	<i>Sphaeralcea coccinea</i>	1-3	15.28	1.68
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
ironplant goldenweed	<i>Haplopappus spinulosus</i>	1-2	0.44	0.44
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	1-2	0.00	0.00
purple prairie clover	<i>Dalea purpurea var. purpurea</i>	1-2	0.00	0.00
slimflower scurfpea	<i>Psoralidium tenuiflorum</i>	0-1	0.00	0.00
woolly locoweed	<i>Astragalus mollissimus</i>	0-1	0.00	0.00
silky crazyweed	<i>Oxytropis sericea</i>	0-1	0.00	0.00
silky sophora	<i>Sophora nuttalliana</i>	0-1	0.00	0.00
variable senecio	<i>Packera neomexicana var. mutabilis</i>	0-1	0.00	0.00
plains bahia	<i>Picradeniopsis oppositifolia</i>	0-1	0.00	0.00
Colorado fouroclock	<i>Mirabilis multiflora</i>	0-1	0.00	0.00
cutleaf evening-primrose	<i>Oenothera coronopifolia</i>	0-1	0.00	0.00
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.00	0.00

rush skeletonplant	<i>Lygodesmia juncea</i>	0-1	2.62	1.02
scarlet gaura	<i>Gaura coccinea</i>	0-1	0.44	0.44
wavyleaf thistle	<i>Cirsium undulatum</i>	0-1	0.00	0.00
western ragweed	<i>Ambrosia psilostachya</i>	0-1	0.00	0.00
woolly Indianwheat	<i>Plantago patagonica</i>	0-1	0.00	0.00
<b>Other native forbs</b>		2-5	9.17	3.36
conyza	<i>Conyza canadensis</i>		3.93	1.22
evening-primrose	<i>Oenothera spp.</i>		0.44	0.44
flatspine stickseed	<i>Lappula echinata var. occidentalis</i>		4.37	1.27
heath aster	<i>Symphotrichum ericoides</i>		0.44	0.44
<b>Non native forbs</b>		0	20.96	3.70
kochia	<i>Kochia scoparia</i>		4.37	1.27
Russian thistle	<i>Salsola iberica</i>		15.28	1.68
yellow sweetclover	<i>Melilotus officinalis</i>		1.31	0.74
<b>Shrubs</b>				
fourwing saltbush	<i>Atriplex canescens</i>	5-15	0.00	0.00
winterfat	<i>Krascheninnikovia lanata</i>	1-5	0.00	0.00
rubber rabbitbrush	<i>Ericameria nauseosa ssp. nauseosa</i>	0-1	0.00	0.00
broom snakeweed	<i>Gutierrezia sarothrae</i>	0-1	0.00	0.00
fringed sagebrush	<i>Artemisia frigida</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.44	0.44
purple pincushion	<i>Escobaria vivipara var. vivipara</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-3	0.00	0.00

Ground Cover	
Type	% Cover
Plant	58.89
Litter	26.11
Bare	15.00
Rock	0.00
n	360



**Figure 20: Loamy A Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

## Loamy A



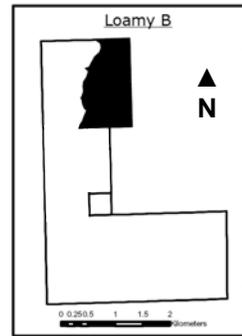
**Figure 21: Photographs of Loamy A** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Loamy B

The Loamy B stratum is located on north portion of the property. Loamy B is northeast of Sand Creek and occupies NPS land on section 13 T17S R46W.

This area has transitioned to a **Blue Grama/Buffalograss Sod Plant Community**, a state usually reached through continuous grazing. Most dominant grasses from the HCPC were not detected, including western wheatgrass and green needlegrass. The other dominant grass, blue grama, was detected slightly above the HCPC level at 26.76% ( $\pm 0.80$ ). The current dominant grass species were detected at 26.76% ( $\pm 0.80$ ) blue grama, 15.96% ( $\pm 1.82$ ) sand dropseed, 13.15% ( $\pm 1.83$ ) sideoats grama, and 2.35% ( $\pm 1.10$ ) tumblegrass. Most dominant forbs from the HCPC were not detected, including American vetch, dotted gayfeather, narrowleaf penstemon, upright prairie coneflower, and purple prairie clover. The other dominant forb, scarlet globemallow, was detected at three times the HCPC level at 10.33% ( $\pm 1.77$ ). The current dominant forb species were detected at a relative abundance of 13.62% ( $\pm 1.83$ ) rush skeletonplant, 10.33% ( $\pm 1.77$ ) scarlet globemallow, 4.23% ( $\pm 1.31$ ) Russian thistle, and 2.82% ( $\pm 1.10$ ) beggars tick. No shrubs were detected.

Much of the diversity and production of HCPC has been lost with the cool season grasses, shrubs, and nitrogen fixing forbs. This has negatively affected energy/nutrient cycling and a shallow "root pan" of blue grama/buffalograss sod has greatly reduced infiltration. The Blue Grama/Buffalograss Sod Plant Community is resistant to change to change due to the grazing tolerance of blue grama and buffalograss. Although many of the dominant plant species of the HCPC are not found within the Loamy B stratum, most of the species are found within the SCMNHS. Species not found on the SCMNHS include: green needlegrass, American vetch, narrowleaf penstemon, fourwing saltbush, and winterfat. However, these species may be present on neighboring lands.



## Loamy B

**Site Type:** Rangeland

**Site Name:** Loamy

**Site ID:** R067BY002CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 60

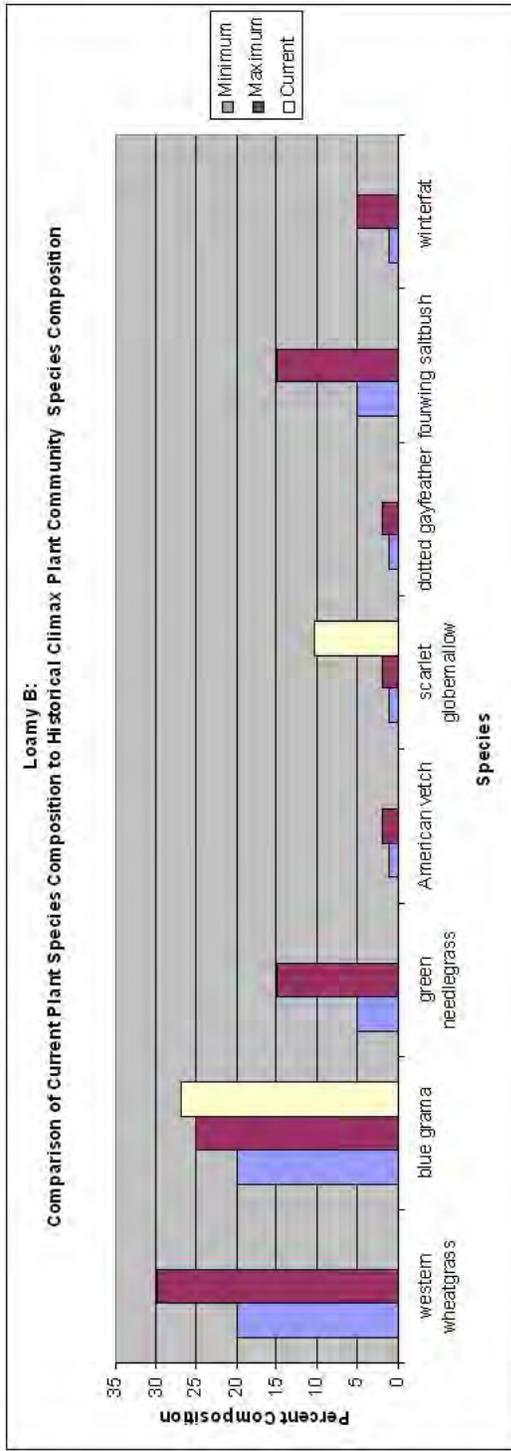
**Date:** June 2005

**Table 9: Loamy B Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>				
western wheatgrass	<i>Pascopyrum smithii</i>	20-30	0.00	0.00
blue grama	<i>Bouteloua gracilis</i>	20-25	26.76	0.80
green needlegrass	<i>Nassella viridula</i>	5-15	0.00	0.00
buffalograss	<i>Buchloe dactyloides</i>	1-5	1.88	0.91
sand dropseed	<i>Sporobolus cryptandrus</i>	1-3	15.96	1.82
bottlebrush squirreltail	<i>Elymus elymoides</i>	0-1	0.00	0.00
Indian ricegrass	<i>Achnatherum hymenoides</i>	0-1	0.00	0.00
little bluestem	<i>Schizachyrium scoparium</i>	0-1	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	0-1	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	0-1	0.00	0.00
ring muhly	<i>Muhlenbergia torreyi</i>	0-1	0.00	0.00
sideoats grama	<i>Bouteloua curtipendula</i>	0-1	13.15	1.83
sixweeks fescue	<i>Vulpia octoflora</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
needleleaf sedge	<i>Carex duriuscula</i>	0-1	0.00	0.00
<b>Other native grasses</b>		1-3	2.35	1.01
tumblegrass	<i>Schedonnardus paniculatus</i>		2.35	1.01
<b>Forbs</b>				
American vetch	<i>Vicia americana</i>	1-5	0.00	0.00
scarlet globemallow	<i>Sphaeralcea coccinea</i>	1-3	10.33	1.77
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
Ironplant goldenweed	<i>Haplopappus spinulosus</i>	1-2	0.00	0.00
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	1-2	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	1-2	0.00	0.00
slimflower scurfpea	<i>Psoralidium tenuiflorum</i>	0-1	0.00	0.00
wooly locoweed	<i>Astragalus mollissimus</i>	0-1	0.00	0.00
silky crazyweed	<i>Oxytropis sericea</i>	0-1	0.00	0.00
silky sophora	<i>Sophora nuttalliana</i>	0-1	0.00	0.00
variable senecio	<i>Packera neomexicana var. mutabilis</i>	0-1	0.00	0.00
plains bahia	<i>Picradeniopsis oppositifolia</i>	0-1	0.00	0.00
Colorado fouroclock	<i>Mirabilis multiflora</i>	0-1	0.00	0.00
cutleaf evening-primrose	<i>Oenothera coronopifolia</i>	0-1	0.00	0.00
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.00	0.00

rush skeletonplant	<i>Lygodesmia juncea</i>	0-1	13.62	1.83
scarlet gaura	<i>Gaura coccinea</i>	0-1	0.47	0.47
wavyleaf thistle	<i>Cirsium undulatum</i>	0-1	0.47	0.47
western ragweed	<i>Ambrosia psilostachya</i>	0-1	0.00	0.00
woolly Indianwheat	<i>Plantago patagonica</i>	0-1	0.94	0.66
<b>Other native forbs</b>		2-5	7.51	4.34
beggars tick	<i>Cryptantha circumscissa</i>		2.82	1.10
blanket flower	<i>Gaillardia pulchella</i>		0.47	0.47
conyza	<i>Conyza canadensis</i>		1.41	0.80
flatspine stickseed	<i>Lappula echinata var. occidentalis</i>		0.94	0.66
pepperpod mustard	<i>Lepidium densiflorum</i>		0.94	0.66
wallflower	<i>Erysimum asperum</i>		0.94	0.66
<b>Non native forbs</b>		0	6.57	2.32
kochia	<i>Kochia scoparia</i>		2.35	1.01
Russian thistle	<i>Salsola iberica</i>		4.23	1.31
<b>Shrubs</b>				
fourwing saltbush	<i>Atriplex canescens</i>	5-15	0.00	0.00
winterfat	<i>Krascheninnikovia lanata</i>	1-5	0.00	0.00
rubber rabbitbrush	<i>Ericameria nauseosa ssp. nauseosa</i>	0-1	0.00	0.00
broom snakeweed	<i>Gutierrezia sarothrae</i>	0-1	0.00	0.00
fringed sagebrush	<i>Artemisia frigida</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.00	0.00
purple pincushion	<i>Escobaria vivipara var. vivipara</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-3	0.00	0.00

Ground Cover	
Type	% Cover
Plant	35.00
Litter	37.50
Bare	27.50
Rock	0.00
n	360



**Figure 22: Loamy B Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

## Loamy B



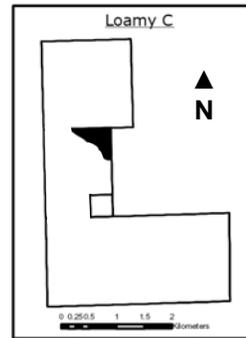
**Figure 23: Photographs of Loamy B** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Loamy C

The Loamy C stratum is located on north portion of the property. Loamy C is northeast of Sand Creek and primarily occupies NPS land on section 24 T17S R46W.

This area has transitioned to a **Blue Grama/Buffalograss Sod Plant Community**, a state usually reached through continuous grazing. Most dominant grasses from the HCPC were not detected, including western wheatgrass and green needlegrass. The other dominant grass, blue grama, was detected at the HCPC level 22.44% ( $\pm 0.67$ ). The current dominant grass species were detected at 22.44% ( $\pm 0.67$ ) blue grama, 11.81% ( $\pm 1.54$ ) buffalograss, 2.76% ( $\pm 1.27$ ) sand dropseed, and 2.76% ( $\pm 0.99$ ) bottlebrush squirreltail. Most dominant forbs from the HCPC were not detected, including American vetch, dotted gayfeather, narrowleaf penstemon, upright prairie coneflower, and purple prairie clover. The other dominant forbs, scarlet globemallow and ironplant goldenweed, were detected at 9.84% ( $\pm 1.52$ ) and 0.79% ( $\pm 0.55$ ), respectively. The current dominant forb species were detected at a relative abundance of 20.87% ( $\pm 0.99$ ) stiff flax, 9.84% ( $\pm 1.52$ ) scarlet globemallow, 5.12% ( $\pm 1.27$ ) rush skeletonplant, and 3.94% ( $\pm 1.15$ ) Missouri milkvetch. The dominant shrubs of the HCPC, fourwing saltbush and winterfat, were not detected. Green rabbitbrush was the only shrub, detected at 0.39% ( $\pm 0.39$ ), a suitable abundance in the HCPC.

Much of the diversity and production of HCPC has been lost with the cool season grasses, shrubs, and nitrogen fixing forbs. This has negatively affected energy/nutrient cycling and a shallow "root pan" of blue grama/buffalograss sod has greatly reduced infiltration. The Blue Grama/Buffalograss Sod Plant Community is resistant to change due to the grazing tolerance of blue grama and buffalograss. Although many of the dominant plant species of the HCPC are not found within the Loamy B stratum, most of the species are found within the SCMNHS. Species not found on the SCMNHS include: green needlegrass, American vetch, narrowleaf penstemon, fourwing saltbush, and winterfat. However, these species may be present on neighboring lands.



## Loamy C

**Site Type:** Rangeland

**Site Name:** Loamy

**Site ID:** R067BY002CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 60

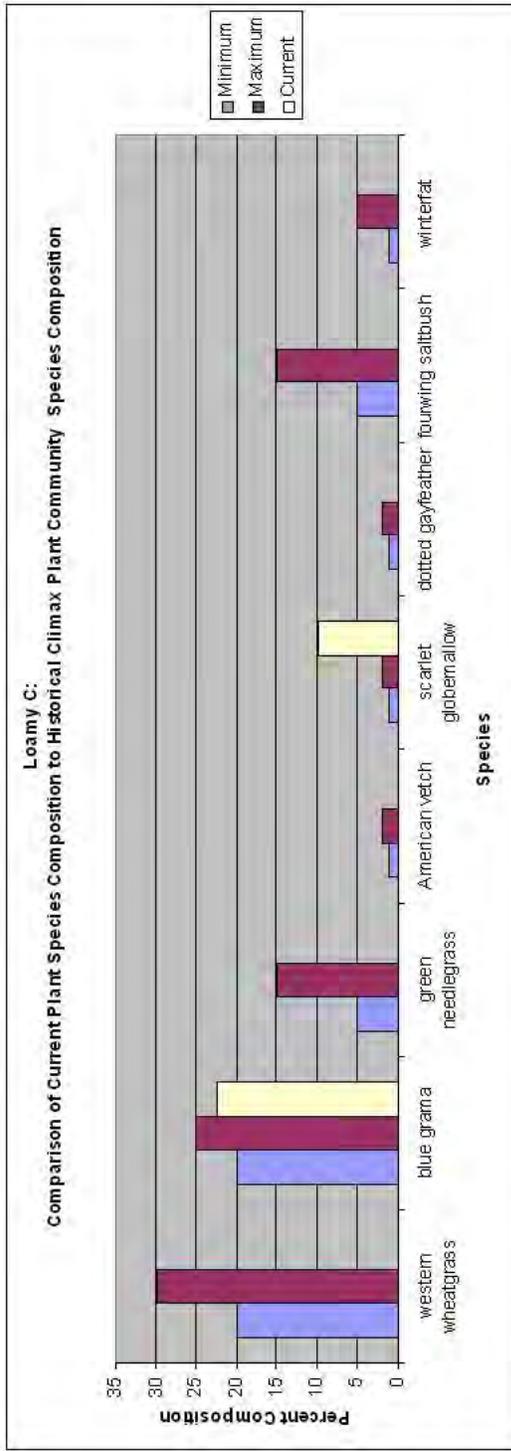
**Date:** June 2005

**Table 10: Loamy C Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>				
western wheatgrass	<i>Pascopyrum smithii</i>	20-30	0.00	0.00
blue grama	<i>Bouteloua gracilis</i>	20-25	22.44	0.67
green needlegrass	<i>Nassella viridula</i>	5-15	0.00	0.00
buffalograss	<i>Buchloe dactyloides</i>	1-5	11.81	1.54
sand dropseed	<i>Sporobolus cryptandrus</i>	1-3	2.76	0.99
bottlebrush squirreltail	<i>Elymus elymoides</i>	0-1	2.76	0.99
Indian ricegrass	<i>Achnatherum hymenoides</i>	0-1	0.00	0.00
little bluestem	<i>Schizachyrium scoparium</i>	0-1	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	0-1	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	0-1	0.79	0.55
ring muhly	<i>Muhlenbergia torreyi</i>	0-1	0.00	0.00
sideoats grama	<i>Bouteloua curtipendula</i>	0-1	0.79	0.55
sixweeks fescue	<i>Vulpia octoflora</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
needleleaf sedge	<i>Carex duriuscula</i>	0-1	0.00	0.00
<b>Other native grasses</b>		1-3	3.15	1.52
hairy grama	<i>Bouteloua hirsuta</i>		1.18	0.67
tumblegrass	<i>Schedonnardus paniculatus</i>		1.97	0.85
<b>Forbs</b>				
American vetch	<i>Vicia americana</i>	1-5	0.00	0.00
scarlet globemallow	<i>Sphaeralcea coccinea</i>	1-3	9.84	1.52
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
ironplant goldenweed	<i>Haplopappus spinulosus</i>	1-2	0.79	0.55
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	1-2	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	1-2	0.00	0.00
slimflower scurfpea	<i>Psoralidium tenuiflorum</i>	0-1	3.54	1.10
woolly locoweed	<i>Astragalus mollissimus</i>	0-1	0.00	0.00
silky crazyweed	<i>Oxytropis sericea</i>	0-1	0.00	0.00
silky sophora	<i>Sophora nuttalliana</i>	0-1	0.00	0.00
variable senecio	<i>Packera neomexicana var. mutabilis</i>	0-1	0.00	0.00
plains bahia	<i>Picradeniopsis oppositifolia</i>	0-1	0.00	0.00
Colorado fouroclock	<i>Mirabilis multiflora</i>	0-1	0.00	0.00
cutleaf evening-primrose	<i>Oenothera coronopifolia</i>	0-1	0.00	0.00

Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.00	0.00
rush skeletonplant	<i>Lygodesmia juncea</i>	0-1	5.12	1.27
scarlet gaura	<i>Gaura coccinea</i>	0-1	2.36	0.92
wavyleaf thistle	<i>Cirsium undulatum</i>	0-1	0.00	0.00
western ragweed	<i>Ambrosia psilostachya</i>	0-1	0.00	0.00
woolly Indianwheat	<i>Plantago patagonica</i>	0-1	0.39	0.39
<b>Other native forbs</b>		2-5	32.28	6.57
conyza	<i>Conyza canadensis</i>		1.57	0.77
curlycup gumweed	<i>Grindelia squarrosa</i>		0.79	0.55
evening-primrose	<i>Oenothera spp.</i>		0.39	0.39
flatspine stickseed	<i>Lappula echinata var. occidentalis</i>		0.39	0.39
groundsel	<i>Senecio integerrimus</i>		0.39	0.39
Hymenopappus sp.	<i>Hymenopappus sp.</i>		0.39	0.39
Missouri milkvetch	<i>Astragalus missouriensis</i>		3.94	1.15
stiff flax	<i>Linum rigidum</i>		20.87	0.99
narrowleaf poisonvetch	<i>Astragalus pectinatus</i>		2.76	0.99
wallflower	<i>Erysimum asperum</i>		0.79	0.55
<b>Non native forbs</b>		0	0.79	0.55
Russian thistle	<i>Salsola iberica</i>		0.79	0.55
<b>Shrubs</b>				
fourwing saltbush	<i>Atriplex canescens</i>	5-15	0.00	0.00
winterfat	<i>Krascheninnikovia lanata</i>	1-5	0.00	0.00
rubber rabbitbrush	<i>Ericameria nauseosa ssp. nauseosa</i>	0-1	0.00	0.00
broom snakeweed	<i>Gutierrezia sarothrae</i>	0-1	0.00	0.00
fringed sagebrush	<i>Artemisia frigida</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.00	0.00
purple pincushion	<i>Escobaria vivipara var. vivipara</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-3	0.39	0.39
green rabbitbrush	<i>Chrysothamnus visidiflorus</i>		0.39	0.39

Ground Cover	
Type	% Cover
Plant	34.72
Litter	33.33
Bare	31.94
Rock	0.00
n	360



**Figure 24: Loamy C Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

## Loamy C



**Figure 25: Photographs of Loamy C** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Loamy Mid Seral

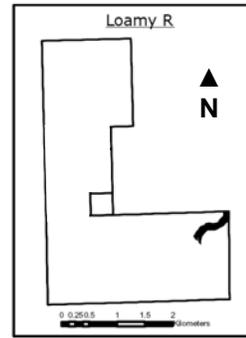
### Loamy R

The Loamy R stratum is located on southeast portion of the property. Loamy R is northeast of Sand Creek and primarily occupies NPS land on section 30 T17S R45W.

This area has transitioned to a **Low Density, Excessive Litter Plant Community**, a state usually reached through the absence of grazing.

Most dominant grasses from the HCPC were detected, including western wheatgrass (above HCPC) and blue grama (below HCPC), 26.49% ( $\pm 0$ ) and 4.64% ( $\pm 1.61$ ), respectively. The other dominant grass, green needlegrass, was not detected. The current dominant grass species were detected at 26.49% ( $\pm 0$ ) western wheatgrass, 19.87% ( $\pm 1.84$ ) sand dropseed, 13.25% ( $\pm 2.12$ ) inland saltgrass, and 9.27% ( $\pm 2.02$ ) buffalograss. Most dominant forbs from the HCPC were not detected, including American vetch, dotted gayfeather, narrowleaf penstemon, upright prairie coneflower, and purple prairie clover. The other dominant forbs, scarlet globemallow and ironplant goldenweed, were detected at, 4.46% ( $\pm 1.61$ ) and 0.66% ( $\pm 0.66$ ), respectively. The current dominant forb species were detected at a relative abundance of 4.46% ( $\pm 1.61$ ) scarlet globemallow, 3.97% ( $\pm 1.51$ ) heath aster, 3.97% ( $\pm 1.51$ ) Russian thistle, and 2.65% ( $\pm 1.27$ ) scarlet gaura. The dominant shrubs of the HCPC, fourwing saltbush and winterfat, were not detected. Plains pricklypear was the only shrub, detected at 0.66% ( $\pm 0.66$ ), a suitable abundance in the HCPC.

The Low Density, Excessive Litter Plant Community has impacted nutrient cycling and is an erosion risk due to plant die-off. Although many of the dominant species of the HCPC are not found within the Loamy R stratum, most of the species are found within the SCMNHs. Species not found on the SCMNHs include: green needlegrass, American vetch, narrowleaf penstemon, fourwing saltbush, and winterfat. However, these species may be present on neighboring lands.



## Loamy R

**Site Type:** Rangeland

**Site Name:** Loamy

**Site ID:** R067BY002CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 40

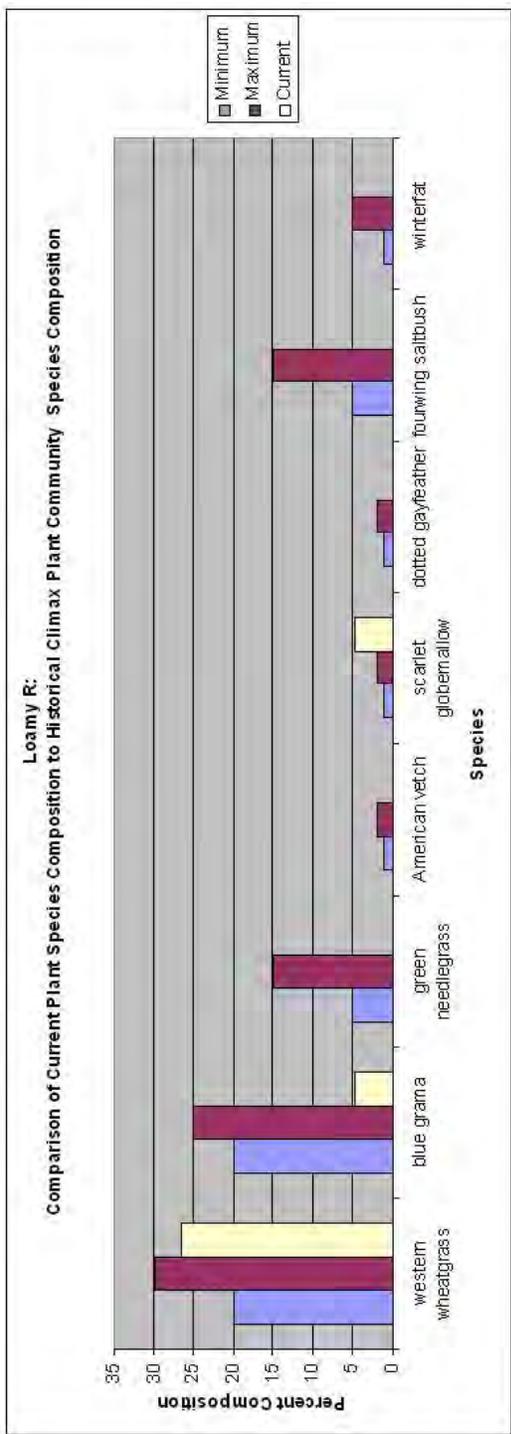
**Date:** July 2005

**Table 11: Loamy R Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>				
western wheatgrass	<i>Pascopyrum smithii</i>	20-30	26.49	0.00
blue grama	<i>Bouteloua gracilis</i>	20-25	4.64	1.61
green needlegrass	<i>Nassella viridula</i>	5-15	0.00	0.00
buffalograss	<i>Buchloe dactyloides</i>	1-5	9.27	2.02
sand dropseed	<i>Sporobolus cryptandrus</i>	1-3	19.87	1.84
bottlebrush squirreltail	<i>Elymus elymoides</i>	0-1	0.00	0.00
Indian ricegrass	<i>Achnatherum hymenoides</i>	0-1	0.00	0.00
little bluestem	<i>Schizachyrium scoparium</i>	0-1	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	0-1	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	0-1	0.00	0.00
ring muhly	<i>Muhlenbergia torreyi</i>	0-1	0.00	0.00
sideoats grama	<i>Bouteloua curtipendula</i>	0-1	0.00	0.00
sixweeks fescue	<i>Vulpia octoflora</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
needleleaf sedge	<i>Carex duriuscula</i>	0-1	0.00	0.00
<b>Other native grasses</b>		1-3	13.91	2.78
alkali sacaton	<i>Sporobolus airoides</i>		0.66	0.66
inland saltgrass	<i>Distichlis spicata</i>		13.25	2.12
<b>Forbs</b>				
American vetch	<i>Vicia americana</i>	1-5	0.00	0.00
scarlet globemallow	<i>Sphaeralcea coccinea</i>	1-3	4.64	1.61
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
ironplant goldenweed	<i>Haplopappus spinulosus</i>	1-2	0.66	0.66
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	1-2	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	1-2	0.00	0.00
slimflower scurfpea	<i>Psoralidium tenuiflorum</i>	0-1	0.00	0.00
woolly locoweed	<i>Astragalus mollissimus</i>	0-1	0.00	0.00
silky crazyweed	<i>Oxytropis sericea</i>	0-1	0.00	0.00
silky sophora	<i>Sophora nuttalliana</i>	0-1	0.00	0.00
variable senecio	<i>Packera neomexicana var. mutabilis</i>	0-1	0.00	0.00
plains bahia	<i>Picradeniopsis oppositifolia</i>	0-1	0.00	0.00
Colorado fouroclock	<i>Mirabilis multiflora</i>	0-1	0.00	0.00
cutleaf evening-primrose	<i>Oenothera coronopifolia</i>	0-1	0.00	0.00

Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.66	0.66
rush skeletonplant	<i>Lygodesmia juncea</i>	0-1	0.00	0.00
scarlet gaura	<i>Gaura coccinea</i>	0-1	2.65	1.27
wavyleaf thistle	<i>Cirsium undulatum</i>	0-1	0.66	0.66
western ragweed	<i>Ambrosia psilostachya</i>	0-1	0.00	0.00
woolly Indianwheat	<i>Plantago patagonica</i>	0-1	0.00	0.00
<b>Other native forbs</b>		2-5	7.95	4.11
buffalo bur	<i>Solanum rostratum</i>		0.66	0.66
heath aster	<i>Symphotrichum ericoides</i>		3.97	1.51
short-ray prairie coneflower	<i>Ratibida tagetes</i>		2.65	1.27
winecup	<i>Callirhoe involucrata</i>		0.66	0.66
<b>Non native forbs</b>		0	7.28	3.96
field bindweed	<i>Convolvulus arvensis</i>		0.66	0.66
kochia	<i>Kochia scoparia</i>		1.99	1.12
purselane	<i>Portulaca oleracea</i>		0.66	0.66
Russian thistle	<i>Salsola iberica</i>		3.97	1.51
<b>Unidentified forbs</b>				
UF12	<i>Fabaceae</i>		0.66	0.66
<b>Shrubs</b>				
fourwing saltbush	<i>Atriplex canescens</i>	5-15	0.00	0.00
winterfat	<i>Krascheninnikovia lanata</i>	1-5	0.00	0.00
rubber rabbitbrush	<i>Ericameria nauseosa ssp. nauseosa</i>	0-1	0.00	0.00
broom snakeweed	<i>Gutierrezia sarothrae</i>	0-1	0.00	0.00
fringed sagebrush	<i>Artemisia frigida</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.66	0.66
purple pincushion	<i>Escobaria vivipara var. vivipara</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-3	0.00	0.00

Ground Cover	
Type	% Cover
Plant	22.08
Litter	74.58
Bare	3.85
Rock	0.00
n	240



**Figure 26: Loamy R Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

Loamy R

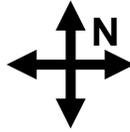
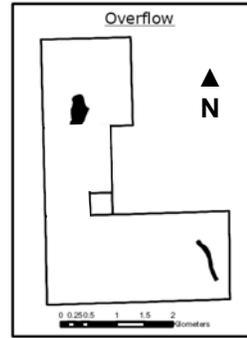


Figure 27: Photographs of Loamy R - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.



**Overflow:****Site Type:** Rangeland**Site Name:** Overflow**Site ID:** R067BY036CO**Major Land Resource Area:** 67B - Central High Plains, Southern Part**Soil Classification:** Fluvaquent\***Physiographic Features**

This site occurs on, or parallel to, intermittent or perennial waterways on the plains. These sites receive additional water from channel flooding and from runoff from surrounding areas. These areas are typically frequently or occasionally flooded. Duration of flooding is very brief to brief. Significant ponding usually does not occur. Landforms include drainage ways, flood plains, and draws. The runoff class is low to medium.

**Soil Features**

The soils of this site are very deep, well drained and slowly to moderately permeable. These soils occur on drainage ways, flood plains and draws. Some soils have gravel at depths below 40 inches. The available water capacity is typically moderate to high. These soils are typically occasionally or frequently flooded. The soil surface layer is typically 3 to 25 inches thick and is loam, clay loam, or silt loam. The soil moisture regime is aridic ustic. The soil temperature regime is mesic.

The Historic Climax Plant Community (HCPC) should exhibit slight to no evidence of rills, wind scoured areas or pedestaled plants. Water flow paths, if any, are broken, irregular in appearance or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact. Sub-surface soil layers are non-restrictive to water movement and root penetration.

These soils are susceptible to wind and water erosion where vegetative cover is inadequate. Channel cutting, deposition, and removals may occur adjacent to streams.

Major soil series correlated to this Ecological Site include: Manzanst, Rago (occasional overflow), Paoli, Haverson, Sampson, Table Mountain, Goshen, and Lohmiller.

**Parent Material Kind:** alluvium**Parent Material Origin:** mixed**Surface Texture:** loam, clay loam, silt loam**Surface Texture Modifier:** none**Subsurface Texture Group:** loamy**Surface Fragments < 3" (% Cover):** 0**Surface Fragments > 3" (%Cover):** 0**SubSurface Fragments < 3" (% Volume):** 0-20**Subsurface Fragments > 3" (% Volume):** 0**Drainage Class:** well - well**Permeability Class:** slow moderate**Depth (inches):** 80**Electrical Conductivity (mmhos/cm)\*\*:** 0 - 2**Sodium Absorption Ratio\*\*:** 0**Soil Reaction (1:1 Water)\*\*:** 6.6 - 8.4**Available Water Capacity (inches)\*\*:** 6 - 8

**Calcium Carbonate Equivalent (percent)\*\*: 0 - 15**

***Historic Climax Plant Community:***

\*A complete soil classification table for Kiowa County is located in Appendix E.  
The historic climax plant community (description follows) has been determined by study of rangeland relic areas, areas protected from excessive disturbance, seasonal use pastures, short durational/time controlled grazing and historical accounts.  
These attributes represent 0-40 inches in depth or to the first restrictive layer.

The plant community described should not necessarily be thought of as the "Desired Plant Community". According to the USDA NRCS National Range and Pasture Handbook, Desired Plant Communities will be determined by the decision-makers and will meet minimum quality criteria established by the NRCS. The main purpose for, including any description of a plant community here is to capture the current knowledge and experience at the time.

**Western Wheatgrass, Green Needlegrass, Big Bluestem, Fourwing saltbush Plant Community**

This is the interpretive plant community and is considered to be the Historic Climax Plant Community (HCPC). This community evolved with grazing by large herbivores and is well suited for grazing by domestic livestock and can be found on areas that are properly managed with prescribed grazing that allows for adequate recovery periods following each grazing event. The potential vegetation is about 75-90% grasses and grass-like plants, 5-10% forbs and 5-15% woody plants.

Major grasses include western wheatgrass, green needlegrass, big bluestem and switchgrass. Other grasses occurring on this community include blue grama, buffalograss, Canada wildrye and yellow Indiangrass. Major forbs and shrubs include American vetch, upright prairie coneflower, fourwing saltbush and winterfat.

This plant community is diverse, stable and productive. It is well suited to carbon sequestration, water yield, wildlife use by many species, livestock use and is esthetically pleasing. 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. This community is resistant to many things except continuous grazing, plowing and/or development into urban or other uses.

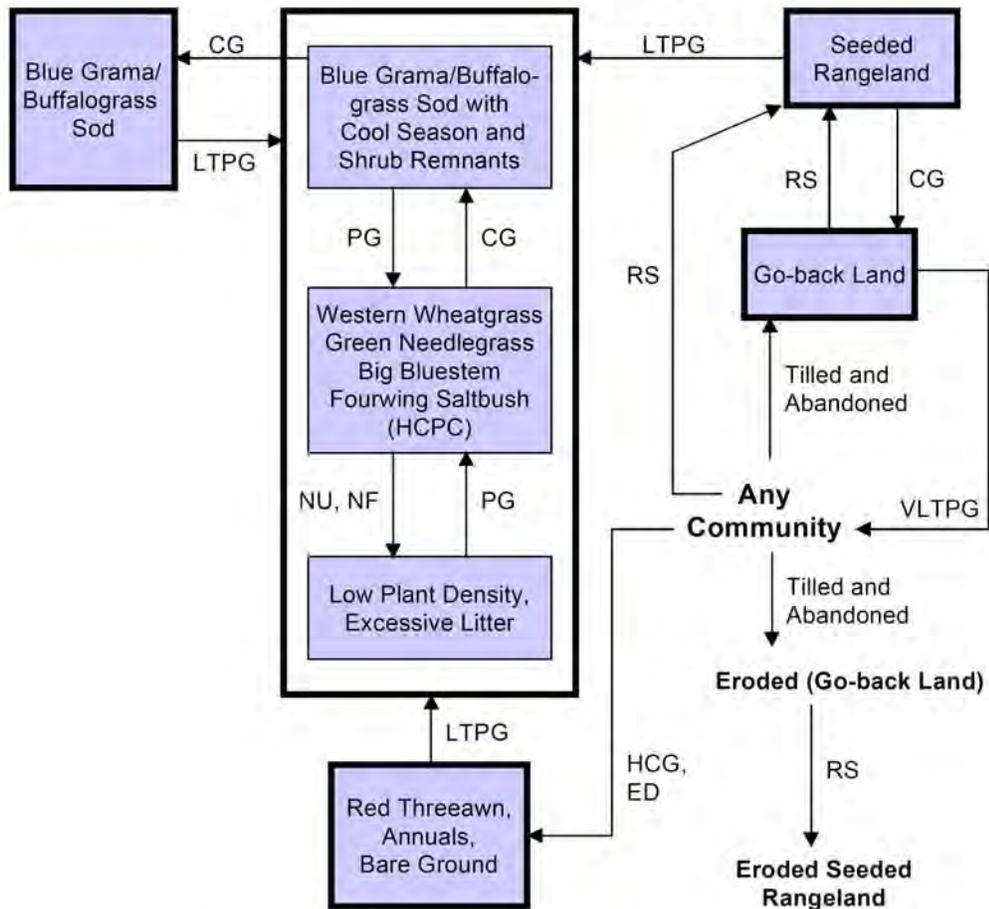
Total annual production ranges from 1200 to 2800 pounds of air-dry vegetation per acre and will average 2000 pounds during an average year.

***Plant Communities and Transitional Pathways***

Deterioration of this site, due to continuous grazing without adequate recovery periods following each grazing occurrence, will cause blue grama and buffalograss to increase. Major grass species such as western wheatgrass, green needlegrass, Canada wildrye, big bluestem, switchgrass and yellow Indiangrass will decrease in frequency and production as well as key shrubs such as fourwing saltbush and winterfat. American vetch and other highly palatable forbs will decrease also. Continuous grazing will eventually cause a blue grama/buffalograss sod to develop. Red threeawn, annuals and bare ground will increase with heavy continuous grazing or excessive defoliation. Plant communities subjected to a non-use status or lack of fire will cause excess litter to accumulate, reducing plant density.

The following diagram illustrates the common plant communities that can occur on the site and the transition pathways (arrows) among communities. Bold lines surrounding each plant community or communities represent ecological thresholds (USDA, NRCS 2004). The

ecological processes are discussed in more detail in the Ecological Site Description from the NRCS Field Office Technical Guide.



**CG** - continuous grazing without adequate recovery opportunity, **ED** - excessive defoliation, **HCG** - heavy continuous grazing, **HCPC** - Historic Climax Plant Community, **LTCG** - long term continuous grazing (>40 yrs), **LTPG** - long term prescribed grazing (>40 yrs), **NF** - no fire, **NU** - non-use, **PG** - prescribed grazing with adequate recovery period, **RS** - range seeding, **VLTPG** - very long term prescribed grazing (>80 yrs)

**Figure 28: Overflow State and Transition Model** - Diagram of the Overflow Ecological Site MRLA 67B community states and transitions (USDA, NRCS 2004).

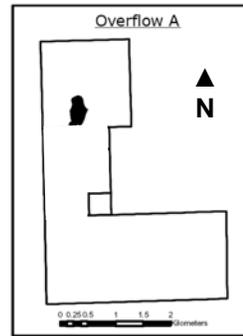
## Overflow Early Seral

### Overflow A

The Overflow A stratum is located on north portion of the property. Overflow A is north of Sand Creek and occupies NPS land on section 13 T17S R46W.

This area has transitioned to a **Low Plant Density, Excessive Litter Plant Community**, a state that usually occurs when grazing is removed for long periods of time or in the absence of fire. The HCPC dominant grasses, western wheatgrass, green needlegrass, big bluestem, and switchgrass, were not detected. The current dominant grass species were detected at 23.79% ( $\pm 1.03$ ) sand dropseed, 8.37% ( $\pm 1.60$ ) blue grama, and 2.64% ( $\pm 1.03$ ) sideoats grama. The HCPC dominant forbs, American vetch, rag sumpweed, and upright prairie coneflower, were not detected. The current dominant forb species were detected at a relative abundance of 25.99% ( $\pm 0.44$ ) Russian thistle, 17.18% ( $\pm 1.64$ ) kochia, and 10.13% ( $\pm 1.67$ ) scarlet globemallow. The dominant shrubs of the HCPC, fourwing saltbush and winterfat, were not detected. Sand sagebrush was the dominant shrub at 1.76% ( $\pm 0.86$ ), an acceptable level for the HCPC.

Much of the nutrients are tied up in excessive litter and this has slowed nutrient cycling. Aboveground litter also limits sunlight that reaches plant crowns and reduces seed germination and establishment. This plant community has the ability to change rapidly. Russian thistle and other disturbance annual forbs were found at high levels in this stratum. Although many of the dominant species of the HCPC are not found within the Overflow A stratum, most of the species are found within the SCMNHs. Species not found on the SCMNHs include: yellow Indiangrass, big bluestem, green needlegrass, American vetch, rag sumpweed, fourwing saltbush, and winterfat. However, these species may be present on neighboring lands.



## Overflow A

**Site Type:** Rangeland

**Site Name:** Overflow

**Site ID:** R067BY036CO

**Major Land Resource Area:** 67b - Central High Plains, Southern Part

**n :** 60

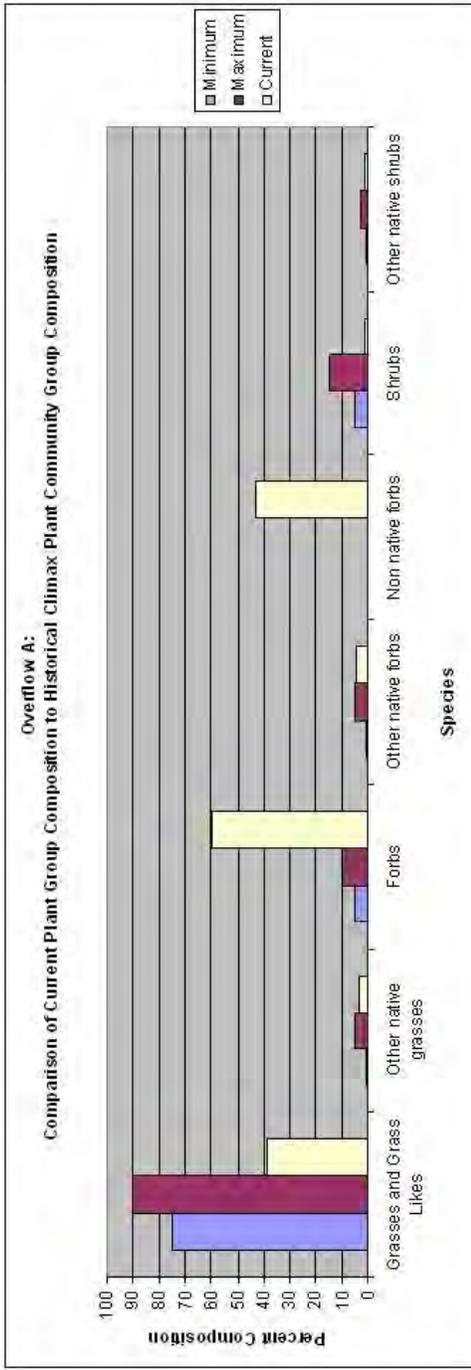
**Date:** June 2005

**Table 12: Overflow A Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

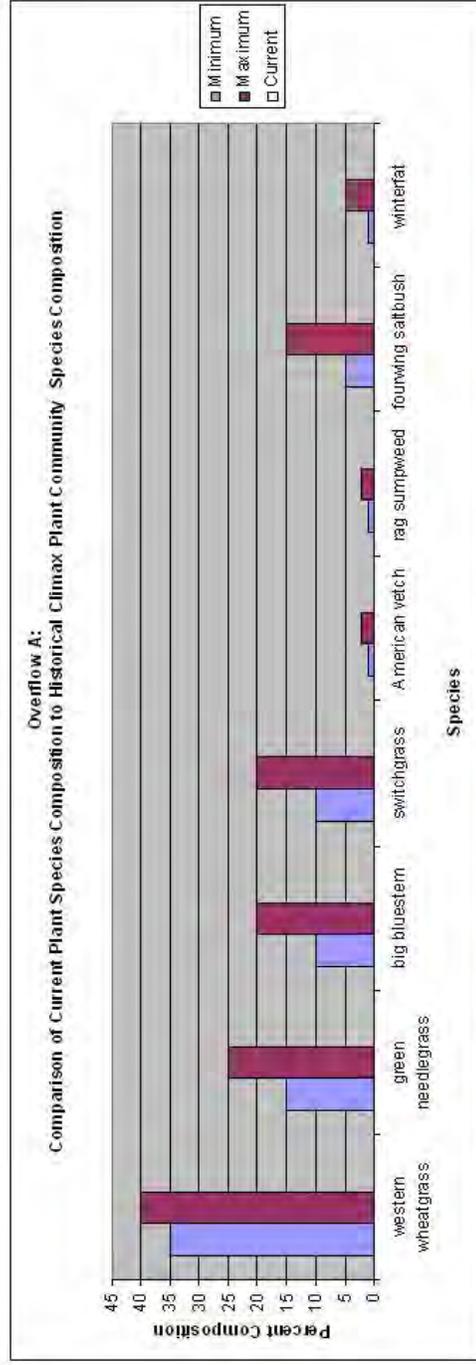
Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>		<b>75-90</b>	<b>38.77</b>	<b>6.15</b>
western wheatgrass	<i>Pascopyrum smithii</i>	35-40	0.00	0.00
green needlegrass	<i>Nassella viridula</i>	15-25	0.00	0.00
big bluestem	<i>Andropogon gerardii</i>	10-20	0.00	0.00
switchgrass	<i>Panicum virgatum</i>	10-20	0.00	0.00
blue grama	<i>Bouteloua gracilis</i>	5-10	8.37	1.60
yellow Indiangrass	<i>Sorghastrum nutans</i>	5-10	0.00	0.00
Canada wildrye	<i>Elymus canadensis</i>	1-7	0.00	0.00
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.00	0.00
buffalograss	<i>Buchloe dactyloides</i>	1-3	0.44	0.44
sideoats grama	<i>Bouteloua curtipendula</i>	0-5	2.64	1.03
slender wheatgrass	<i>Elymus trachycaulus</i>	0-5	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	0-1	0.00	0.00
prairie junegrass	<i>Koeleria macrantha</i>	0-1	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	0-1	0.00	0.00
sand dropseed	<i>Sporobolus cryptandrus</i>	0-1	23.79	1.03
prairie sandreed	<i>Calamovilfa longifolia</i>	0-1	0.00	0.00
sixweeks fescue	<i>Vulpia octoflora</i>	0-1	0.00	0.00
tall dropseed	<i>Sporobolus compositus</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
<b>Other native grasses</b>		<b>1-5</b>	<b>3.52</b>	<b>2.05</b>
bottlebrush squirreltail	<i>Elymus elymoides</i>		1.76	0.86
prairie threeawn	<i>Aristida oligantha</i>		1.32	0.75
tumblegrass	<i>Schedonnardus paniculatus</i>		0.44	0.44
<b>Forbs</b>		<b>5-10</b>	<b>59.47</b>	<b>7.94</b>
American vetch	<i>Vicia americana</i>	1-2	0.00	0.00
rag sumpweed	<i>Iva xanthifolia</i>	1-2	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	1-2	0.00	0.00
Missouri goldenrod	<i>Solidago missouriensis</i>	0-2	0.00	0.00
curlycup gumweed	<i>Grindelia squarrosa</i>	0-1	0.00	0.00
false boneset	<i>Brickellia eupatorioides</i>	0-1	0.00	0.00
hairy goldenaster	<i>Heterotheca villosa</i>	0-1	0.00	0.00
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.00	0.00
Missouri milkvetch	<i>Astragalus missouriensis</i>	0-1	0.00	0.00
narrowleaf poisonvetch	<i>Astragalus pectinatus</i>	0-1	0.00	0.00

prairie larkspur	<i>Delphinium carolinianum</i>	0-1	0.00	0.00
prairie groundsel	<i>Packera plattensis</i>	0-1	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	0-1	0.00	0.00
scarlet gaura	<i>Gaura coccinea</i>	0-1	0.00	0.00
scarlet globemallow	<i>Sphaeralcea coccinea</i>	0-1	10.13	1.67
slimflower scurfpea	<i>Psoraleidium tenuiflorum</i>	0-1	1.32	0.75
western ragweed	<i>Ambrosia psilostachya</i>	0-1	0.00	0.00
<b>Other native forbs</b>		1-5	4.85	3.44
beggars tick	<i>Cryptantha circumscissa</i>		0.44	0.44
Chenopodium sp. #1	<i>Chenopodium sp.</i>		0.44	0.44
conyza	<i>Conyza canadensis</i>		1.32	0.75
heath aster	<i>Symphyotrichum ericoides</i>		0.88	0.62
short-ray prairie coneflower	<i>Ratibida tagetes</i>		1.32	0.75
woolly Indianwheat	<i>Plantago patagonica</i>		0.44	0.44
<b>Non native forbs</b>		0	43.17	2.08
kochia	<i>Kochia scoparia</i>		17.18	1.64
Russian thistle	<i>Salsola iberica</i>		25.99	0.44
<b>Shrubs</b>		5-15	1.76	0.86
fourwing saltbush	<i>Atriplex canescens</i>	5-15	0.00	0.00
winterfat	<i>Krascheninnikovia lanata</i>	1-5	0.00	0.00
fringed sagebrush	<i>Artemisia frigida</i>	0-1	0.00	0.00
green plume rabbitbrush	<i>Ericameria nauseosa ssp. nauseosa</i> <i>var. glabrata</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.00	0.00
rubber rabbitbrush	<i>Ericameria nauseosa ssp. nauseosa</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-3	1.76	0.86
sand sagebrush	<i>Artemisia filifolia</i>		1.76	0.86

Ground Cover	
Type	% Cover
Plant	40.28
Litter	56.67
Bare	3.06
Rock	0.00
n	360



**Figure 29: Overflow A Plant Group Composition** - This graph depicts the current plant group composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that plant group on the Ecological Site. The yellow is the current plant group composition.



**Figure 30: Overflow A Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

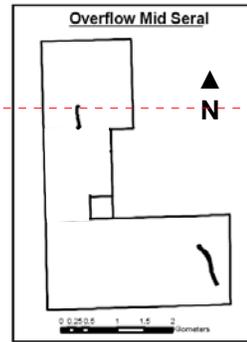
## Overflow A



**Figure 31: Photographs of Overflow A** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Overflow Mid Seral

This area has transitioned to a **Blue Grama/Buffalograss Sod Plant Community**, a state usually reached through continuous grazing. Two HCPC dominant grasses, green needlegrass and big bluestem, were not detected. The other dominant grasses were detected below HCPC levels at 9.00% ( $\pm$  1.07) western wheatgrass and 3.79% ( $\pm$  0.85) switchgrass. The current dominant grass species were detected at 14.69% ( $\pm$  0.89) sideoats grama, 9.00% ( $\pm$  1.07) western wheatgrass, and 6.16% ( $\pm$  1.00) blue grama. The HCPC dominant forbs, American vetch, rag sumpweed, and upright prairie coneflower, were not detected. The current dominant forb species were detected at a relative abundance of 11.85% ( $\pm$  1.03) short-ray prairie coneflower, 9.48% ( $\pm$  1.07) winecup, 5.92% ( $\pm$  0.99) slimflower scurfpea, and 3.55% ( $\pm$  0.83) Russian thistle. The dominant shrubs of the HCPC, fourwing saltbush and winterfat, were not detected. Sand sagebrush was the dominant shrub at 0.24% ( $\pm$  0.24), an acceptable level for the HCPC.



Comment [RAR1]: Right community?

The Blue Grama/Buffalograss Sod Plant Community has lost many tallgrass species, important forbs, and shrubs. This community has reduced production and is very resistant to change due to the grazing tolerance of blue grama. Energy and nutrient cycles have been greatly impaired and infiltration is greatly reduced due to the “root pan” of blue grama. Russian thistle and other disturbance annual forbs were found at high levels in this stratum. Although many of the dominant species of the HCPC are not found within the Overflow Mid Seral stratum, most of the species are found within the SCMNHs. Species not found on the SCMNHs include: yellow Indiangrass, big bluestem, green needlegrass, American vetch, rag sumpweed, fourwing saltbush, and winterfat. However, these species may be present on neighboring lands.

## Overflow Mid Seral

**Site Type:** Rangeland

**Site Name:** Overflow

**Site ID:** R067BY036CO

**Major Land Resource Area:** 67b - Central High Plains, Southern Part

**n :** 80

**Date:** June 2005

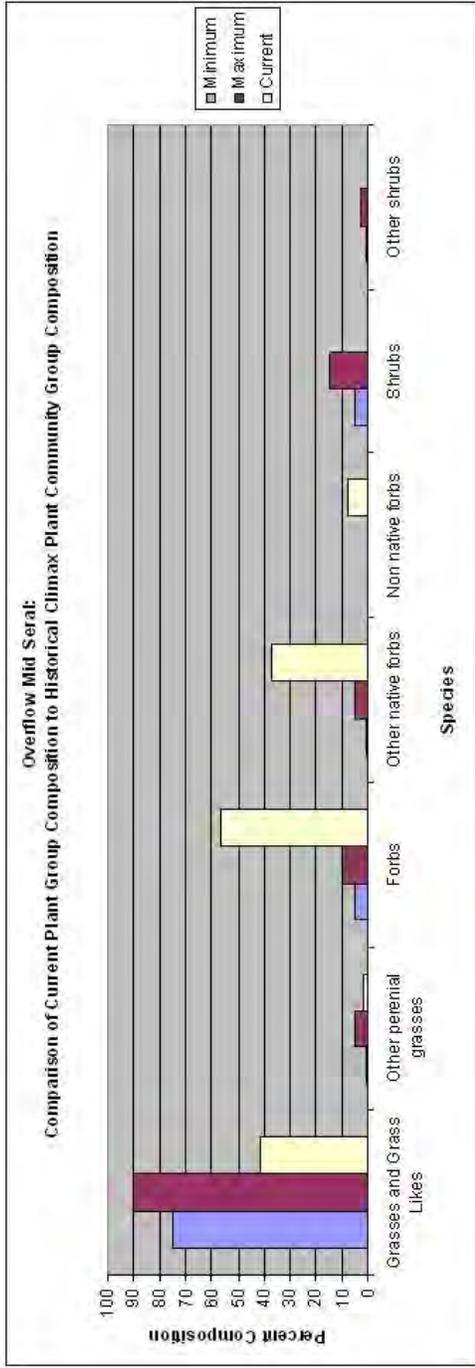
**Table 13: Overflow Mid Seral Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>		75-90	41.71	7.43
western wheatgrass	<i>Pascopyrum smithii</i>	35-40	9.00	1.07
green needlegrass	<i>Nassella viridula</i>	15-25	0.00	0.00
big bluestem	<i>Andropogon gerardii</i>	10-20	0.00	0.00
switchgrass	<i>Panicum virgatum</i>	10-20	3.79	0.85
blue grama	<i>Bouteloua gracilis</i>	5-10	6.16	1.00
yellow Indiangrass	<i>Sorghastrum nutans</i>	5-10	0.00	0.00
Canada wildrye	<i>Elymus canadensis</i>	1-7	1.18	0.52
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.00	0.00
buffalograss	<i>Buchloe dactyloides</i>	1-3	3.32	0.81
sideoats grama	<i>Bouteloua curtipendula</i>	0-5	14.69	0.89
slender wheatgrass	<i>Elymus trachycaulus</i>	0-5	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	0-5	0.00	0.00
prairie junegrass	<i>Koeleria macrantha</i>	0-1	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	0-1	0.24	0.24
sand dropseed	<i>Sporobolus cryptandrus</i>	0-1	1.18	0.52
prairie sandreed	<i>Calamovilfa longifolia</i>	0-1	0.00	0.00
tall dropseed	<i>Sporobolus compositus</i>	0-1	0.00	0.00
sixweeks fescue	<i>Vulpia octoflora</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
<b>Other native grasses</b>		1-5	2.13	1.55
bottlebrush squirreltail	<i>Elymus elymoides</i>		0.71	0.41
hairy grama	<i>Bouteloua hirsuta</i>		0.24	0.24
inland saltgrass	<i>Distichlis spicata</i>		0.24	0.24
tumblegrass	<i>Schedonnardus paniculatus</i>		0.47	0.33
witchgrass	<i>Panicum capillare</i>		0.47	0.33
<b>Forbs</b>		5-10	56.64	15.79
American vetch	<i>Vicia americana</i>	1-2	0.00	0.00
rag sumpweed	<i>Iva xanthifolia</i>	1-2	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	1-2	0.00	0.00
Missouri goldenrod	<i>Solidago missouriensis</i>	0-2	0.00	0.00
curlycup gumweed	<i>Grindelia squarrosa</i>	0-1	0.47	0.33
false boneset	<i>Brickellia eupatorioides</i>	0-1	0.00	0.00
hairy goldenaster	<i>Heterotheca villosa</i>	0-1	0.00	0.00
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.24	0.24

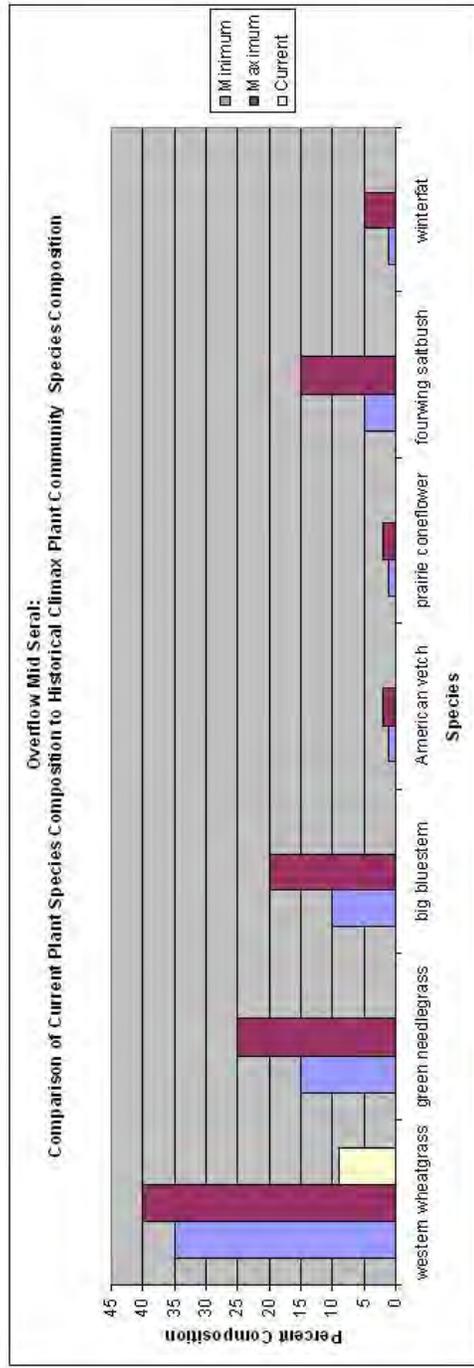
Missouri milkvetch	<i>Astragalus missouriensis</i>	0-1	0.00	0.00
narrowleaf poisonvetch	<i>Astragalus pectinatus</i>	0-1	0.00	0.00
prairie larkspur	<i>Delphinium carolinianum</i>	0-1	0.00	0.00
prairie groundsel	<i>Packera plattensis</i>	0-1	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	0-1	0.00	0.00
scarlet gaura	<i>Gaura coccinea</i>	0-1	3.32	0.81
scarlet globemallow	<i>Sphaeralcea coccinea</i>	0-1	1.42	0.56
slimflower scurfpea	<i>Psoraleidum tenuiflorum</i>	0-1	5.92	0.99
western ragweed	<i>Ambrosia psilostachya</i>	0-1	0.24	0.24
<b>Other native forbs</b>		1-5	37.20	10.21
Aster sp.	<i>Aster sp.</i>		0.47	0.33
Astragalus sp.	<i>Astragalus sp.</i>		0.24	0.24
bush morning glory	<i>Ipomoea leptophylla</i>		0.47	0.33
common groundcherry	<i>Physalis longifolia</i>		0.95	0.46
common sunflower	<i>Helianthus annuus</i>		0.24	0.24
conyza	<i>Conyza canadensis</i>		0.95	0.46
ironplant goldenweed	<i>Haplopappus spinulosus</i>		0.47	0.33
fetid marigold	<i>Dyssodia papposa</i>		0.47	0.33
heath aster	<i>Symphotrichum ericoides</i>		3.08	0.79
narrowleaf fourclock	<i>Mirabilis linearis</i>		0.24	0.24
Oxytropis sp.	<i>Oxytropis sp.</i>		1.42	0.56
poison milkweed	<i>Asclepias subverticillata</i>		0.24	0.24
prairie groundcherry	<i>Physalis pumila</i>		0.47	0.33
prostrate vervain	<i>Verbena bracteata</i>		0.47	0.33
rush skeletonplant	<i>Lygodesmia juncea</i>		0.95	0.46
short-ray prairie coneflower	<i>Ratibida tagetes</i>		11.85	1.03
snow on the mountain	<i>Euphorbia marginata</i>		0.47	0.33
stiff flax	<i>Linum rigidum</i>		0.24	0.24
Texas croton	<i>Croton texensis</i>		0.24	0.24
thyme-leaved spurge	<i>Chamaesyce serpyllifolia ssp. serpyllifolia</i>		0.71	0.41
wavyleaf thistle	<i>Cirsium undulatum</i>		2.61	0.73
white prairie clover	<i>Dalea candida</i>		0.24	0.24
winecup	<i>Callirhoe involucrata</i>		9.48	1.07
woolly Indianwheat	<i>Plantago patagonica</i>		0.24	0.24
<b>Non native forbs</b>		0	7.82	2.42
field bindweed	<i>Convolvulus arvensis</i>		2.61	0.73
kochia	<i>Kochia scoparia</i>		1.18	0.52
Russian thistle	<i>Salsola iberica</i>		3.55	0.83
yellow sweetclover	<i>Melilotus officinalis</i>		0.47	0.33
<b>Unidentified forbs</b>				
UF10	<i>Chenopodiaceae</i>		1.18	0.52
UF12	<i>Fabaceae</i>		0.24	0.24
<b>Shrubs</b>		5-15	0.24	0.00
fourwing saltbush	<i>Atriplex canescens</i>	5-15	0.00	0.00
winterfat	<i>Krascheninnikovia lanata</i>	1-5	0.00	0.00
fringed sagebrush	<i>Artemisia frigida</i>	0-1	0.00	0.00
green plume rabbitbrush	<i>Ericameria nauseosa ssp. nauseosa var. glabrata</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.00	0.00
rubber rabbitbrush	<i>Ericameria nauseosa ssp. nauseosa</i>	0-1	0.00	0.00

<b>Other native shrubs</b>		1-3	0.24	0.00
sand sagebrush	<i>Artemisia filifolia</i>		0.24	0.00

<b>Ground Cover</b>	
Type	% Cover
Plant	38.75
Litter	42.08
Bare	19.17
Rock	0.00
n	240

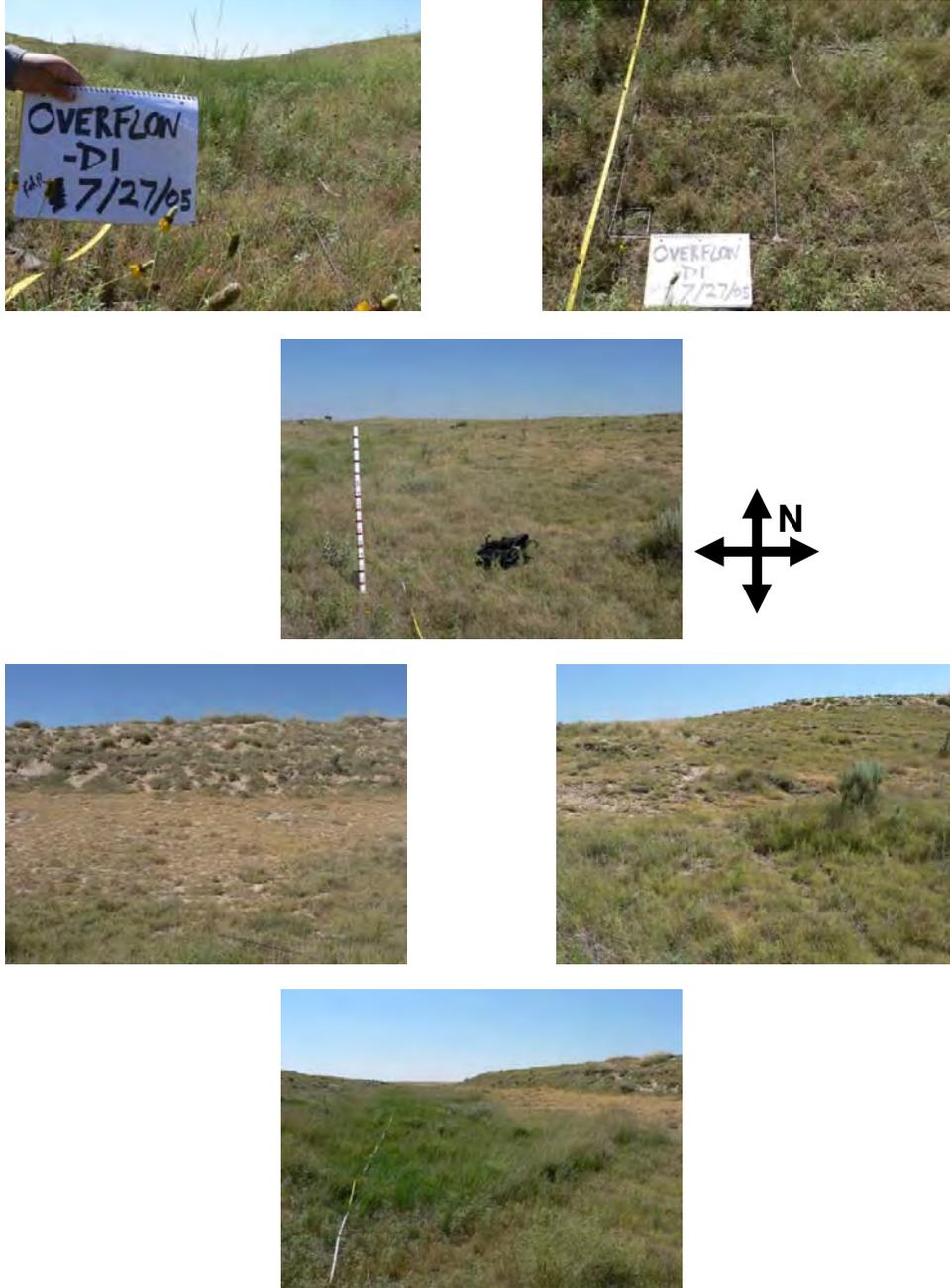


**Figure 33: Overflow Mid Seral Plant Group Composition** - This graph depicts the current plant group composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that plant group on the Ecological Site. The yellow is the current group composition.



**Figure 32: Overflow Mid Seral Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

### Overflow Mid Seral



**Figure 34: Photographs of Overflow Mid Seral** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

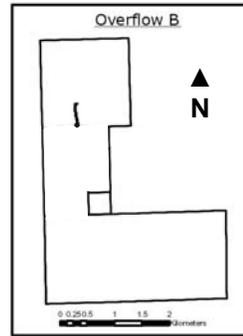
## Overflow B

The Overflow B stratum is located on north portion of the property. Overflow B is north of Sand Creek and occupies NPS land on section 13 T17S R46W.

This area has transitioned to a **Blue Grama/Buffalograss Sod Plant Community**, a state usually reached through continuous grazing. Switchgrass was the only HCPC dominate grass detected, at a reduced level of 6.08% ( $\pm$  1.58). Other HCPC dominant grasses, western wheatgrass, green needlegrass, and big bluestem, were not detected.

The current dominant grass species were detected at 20.99% ( $\pm$  0.77) sideoats grama, 11.60% ( $\pm$  1.77) blue grama, and 6.08% ( $\pm$  1.58) switchgrass. The HCPC dominant forbs, American vetch, rag sumpweed, and upright prairie coneflower, were not detected. The current dominant forb species were detected at a relative abundance of 7.18% ( $\pm$  1.66) scarlet gaura, 7.18% ( $\pm$  1.66) Russian thistle, 6.63% ( $\pm$  1.62) slimflower scurfpea, and 4.42% ( $\pm$  1.42) wavyleaf thistle. The dominant shrubs of the HCPC, fourwing saltbush and winterfat, were not detected. Sand sagebrush was the dominant shrub at 0.55% ( $\pm$  0.55).

The Blue Grama/Buffalograss Sod Plant Community has lost many tallgrass species, important forbs, and shrubs. This community has reduced production and is very resistant to change due to the grazing tolerance of blue grama. Energy and nutrient cycles have been greatly impaired and infiltration is greatly reduced due to the "root pan" of blue grama. Russian thistle was found at high levels in this stratum. Although many of the dominant species of the HCPC are not found within the Overflow B stratum, most of the species are found within the SCMNHS. Species not found on the SCMNHS include: yellow Indiangrass, big bluestem, green needlegrass, American vetch, rag sumpweed, fourwing saltbush, and winterfat. However, these species may be present on neighboring lands.



## Overflow B

**Site Type:** Rangeland

**Site Name:** Overflow

**Site ID:** R067BY036CO

**Major Land Resource Area:** 67b - Central High Plains, Southern Part

**n :** 40

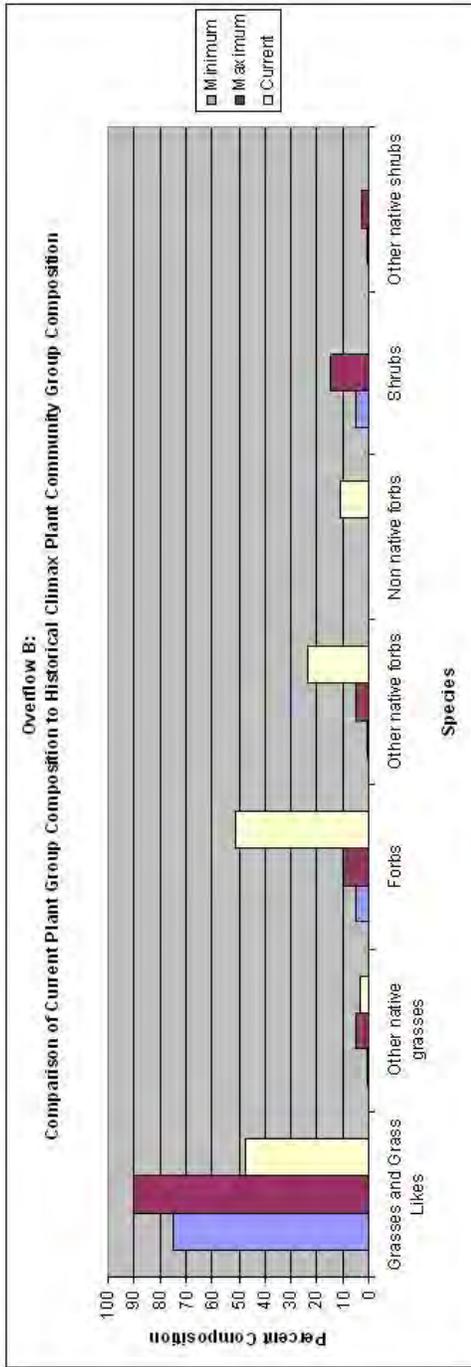
**Date:** June 2005

**Table 14: Loamy Overflow B Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

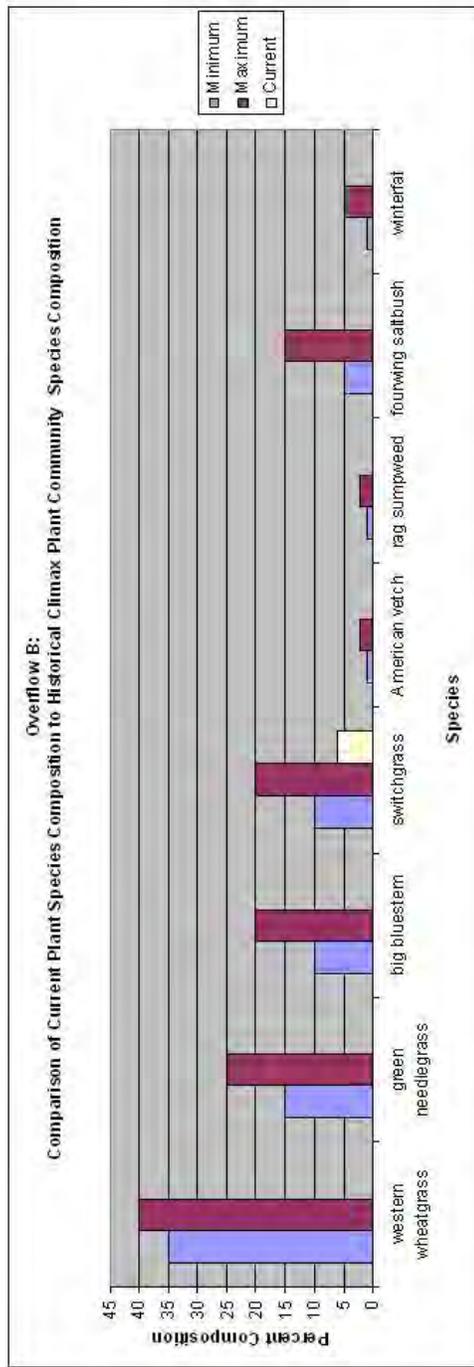
Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>		75-90	46.96	9.42
western wheatgrass	<i>Pascopyrum smithii</i>	35-40	0.00	0.00
green needlegrass	<i>Nassella viridula</i>	15-25	0.00	0.00
big bluestem	<i>Andropogon gerardii</i>	10-20	0.00	0.00
switchgrass	<i>Panicum virgatum</i>	10-20	6.08	1.58
blue grama	<i>Bouteloua gracilis</i>	5-10	11.60	1.77
yellow Indiangrass	<i>Sorghastrum nutans</i>	5-10	0.00	0.00
Canada wildrye	<i>Elymus canadensis</i>	1-7	1.10	0.77
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.00	0.00
buffalograss	<i>Buchloe dactyloides</i>	1-3	0.55	0.55
sideoats grama	<i>Bouteloua curtipendula</i>	0-5	20.99	0.77
slender wheatgrass	<i>Elymus trachycaulus</i>	0-5	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	0-1	0.00	0.00
prairie junegrass	<i>Koeleria macrantha</i>	0-1	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	0-1	0.00	0.00
sand dropseed	<i>Sporobolus cryptandrus</i>	0-1	2.76	1.17
prairie sandreed	<i>Calamovilfa longifolia</i>	0-1	0.00	0.00
sixweeks fescue	<i>Vulpia octoflora</i>	0-1	0.00	0.00
tall dropseed	<i>Sporobolus compositus</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
<b>Other native grasses</b>		1-5	3.87	2.81
bottlebrush squirreltail	<i>Elymus elymoides</i>		1.66	0.93
hairy grama	<i>Bouteloua hirsuta</i>		0.55	0.55
tumblegrass	<i>Schedonnardus paniculatus</i>		0.55	0.55
witchgrass	<i>Panicum capillare</i>		1.10	0.77
<b>Forbs</b>		5-10	51.38	20.60
American vetch	<i>Vicia americana</i>	1-2	0.00	0.00
rag sumpweed	<i>Iva xanthifolia</i>	1-2	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	1-2	0.00	0.00
Missouri goldenrod	<i>Solidago missouriensis</i>	0-2	0.00	0.00
curlycup gumweed	<i>Grindelia squarrosa</i>	0-1	0.00	0.00
false boneset	<i>Brickellia eupatorioides</i>	0-1	0.00	0.00
hairy goldenaster	<i>Heterotheca villosa</i>	0-1	0.00	0.00
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.00	0.00
Missouri milkvetch	<i>Astragalus missouriensis</i>	0-1	0.00	0.00

narrowleaf poisonvetch	<i>Astragalus pectinatus</i>	0-1	0.00	0.00
prairie larkspur	<i>Delphinium carolinianum</i>	0-1	0.00	0.00
prairie groundsel	<i>Packera plattensis</i>	0-1	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	0-1	0.00	0.00
scarlet gaura	<i>Gaura coccinea</i>	0-1	7.18	1.66
scarlet globemallow	<i>Sphaeralcea coccinea</i>	0-1	2.76	1.17
slimflower scurfpea	<i>Psoralidium tenuiflorum</i>	0-1	6.63	1.62
western ragweed	<i>Ambrosia psilostachya</i>	0-1	0.55	0.55
<b>Other native forbs</b>		1-5	23.20	11.99
Aster sp.	<i>Aster sp.</i>		1.10	0.77
Astragalus sp.	<i>Astragalus sp.</i>		0.55	0.55
bush morning glory	<i>Ipomoea leptophylla</i>		1.10	0.77
common groundcherry	<i>Physalis longifolia</i>		0.55	0.55
conyza	<i>Conyza canadensis</i>		2.21	1.06
ironplant goldenweed	<i>Haplopappus spinulosus</i>		1.10	0.77
heath aster	<i>Symphotrichum ericoides</i>		3.87	1.34
narrowleaf fourclock	<i>Mirabilis linearis</i>		0.55	0.55
Oxytropis sp.	<i>Oxytropis sp.</i>		3.31	1.26
prairie groundcherry	<i>Physalis pumila</i>		1.10	0.77
rush skeletonplant	<i>Lygodesmia juncea</i>		2.21	1.06
snow on the mountain	<i>Euphorbia marginata</i>		0.55	0.55
Texas croton	<i>Croton texensis</i>		0.55	0.55
wavyleaf thistle	<i>Cirsium undulatum</i>		4.42	1.42
<b>Non native forbs</b>		0	11.05	3.60
kochia	<i>Kochia scoparia</i>		2.76	1.17
Russian thistle	<i>Salsola iberica</i>		7.18	1.66
yellow sweetclover	<i>Melilotus officinalis</i>		1.10	0.77
<b>Unidentified forbs</b>				
UF10	<i>Chenopodiaceae</i>		1.10	0.77
<b>Shrubs</b>		5-15	0.55	0.55
fourwing saltbush	<i>Atriplex canescens</i>	5-15	0.00	0.00
winterfat	<i>Krascheninnikovia lanata</i>	1-5	0.00	0.00
fringed sagebrush	<i>Artemisia frigida</i>	0-1	0.00	0.00
green plume rabbitbrush	<i>Ericameria nauseosa ssp. nauseosa var. glabrata</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.00	0.00
rubber rabbitbrush	<i>Ericameria nauseosa ssp. nauseosa</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-3	0.55	0.55
sand sagebrush	<i>Artemisia filifolia</i>		0.55	0.55

Ground Cover	
Type	% Cover
Plant	38.75
Litter	42.08
Bare	19.17
Rock	0.00
n	240



**Figure 36: Overflow B Plant Group Composition** - This graph depicts the current plant group composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that plant group on the Ecological Site. The yellow is the current group composition.



**Figure 35: Overflow B Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

## Overflow B



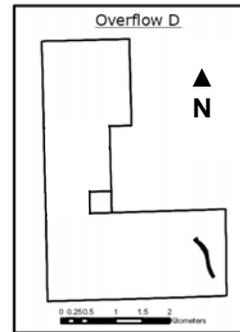
**Figure 37: Photographs of Overflow B** - The top left is a profile shot of the transect and the top right is a plot picture.

## Overflow D

The Overflow D stratum is located on southeast portion of the property. Overflow D is east of Sand Creek and occupies NPS land on section 30 T17S R45W.

This area has transitioned to a **Low Plant Density, Excessive Litter Plant Community**, a state that usually occurs when grazing is removed for long periods of time or in the absence of fire. Two dominant grasses, western wheatgrass and switchgrass, were detected but at reduced levels of the HCPC at 15.77% ( $\pm 0.58$ ) and 2.07% ( $\pm 0.88$ ), respectively. The other dominant grasses, big bluestem and green needlegrass, were not detected. The current dominant grass species were detected at 15.77% ( $\pm 0.58$ ) western wheatgrass, 9.96% ( $\pm 1.30$ ) sideoats grama, 5.39% ( $\pm 1.24$ ) buffalograss, 2.07% ( $\pm 0.88$ ) blue grama, and 2.07% ( $\pm 0.88$ ) switchgrass. Most HCPC dominant forbs, American vetch and rag sumpweed, were not detected. The other HCPC dominant forb, upright prairie coneflower was detected at 5 times the HCPC levels at 10.79% ( $\pm 1.27$ ). The current dominant forb species were detected at a relative abundance of 16.60% ( $\pm 0$ ) winecup, 9.96% ( $\pm 1.30$ ) short-ray prairie coneflower, 5.39% ( $\pm 1.24$ ) slimflower scurfpea, and 4.56% ( $\pm 1.19$ ) field bindweed. No shrubs were detected.

Much of the nutrients are tied up in excessive litter and this has slowed nutrient cycling. Aboveground litter also limits sunlight from reaching plant crowns and reduces seed germination and establishment. This plant community has the ability to change rapidly. Field bindweed was found at high levels in this stratum. Although many of the dominant species of the HCPC are not found within the Overflow D stratum, most of the species are found within the SCMNHs. Species not found on the SCMNHs include: yellow Indiangrass, big bluestem, green needlegrass, American vetch, rag sumpweed, fourwing saltbush, and winterfat. However, these species may be present on neighboring lands.



## Overflow D

**Site Type:** Rangeland

**Site Name:** Overflow

**Site ID:** R067BY036CO

**Major Land Resource Area:** 67b - Central High Plains, Southern Part

**n :** 60

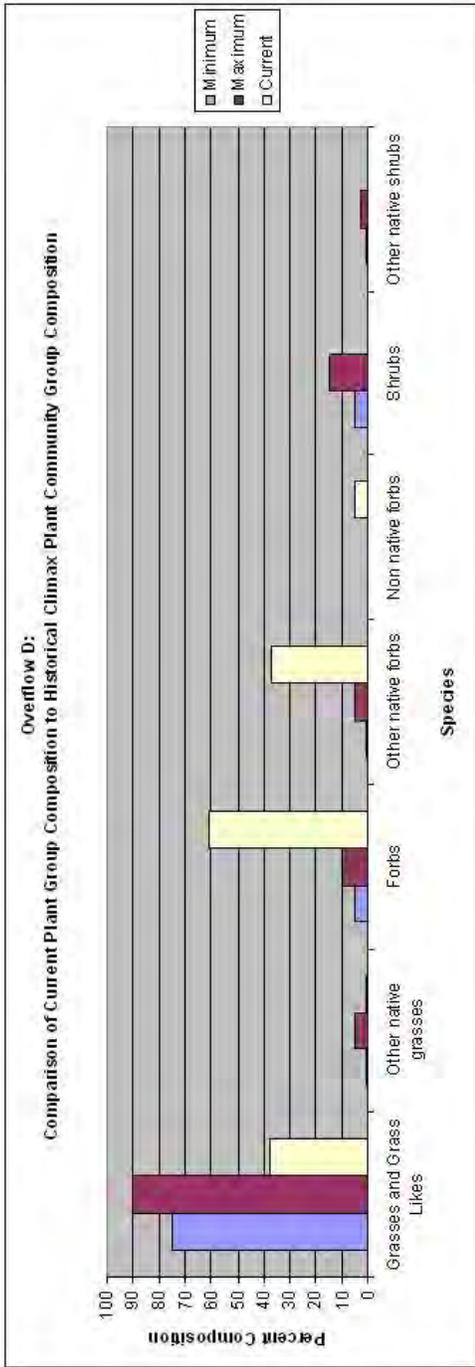
**Date:** July 2005

**Table 15: Overflow D Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

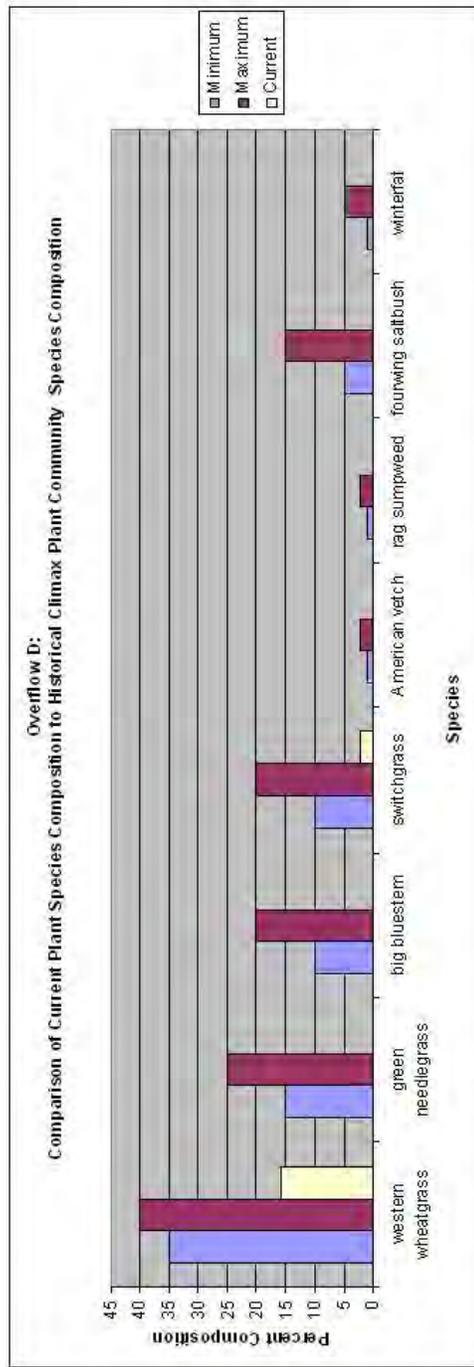
Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>		75-90	37.76	6.83
western wheatgrass	<i>Pascopyrum smithii</i>	35-40	15.77	0.58
green needlegrass	<i>Nassella viridula</i>	15-25	0.00	0.00
big bluestem	<i>Andropogon gerardii</i>	10-20	0.00	0.00
switchgrass	<i>Panicum virgatum</i>	10-20	2.07	0.88
blue grama	<i>Bouteloua gracilis</i>	5-10	2.07	0.88
yellow Indiangrass	<i>Sorghastrum nutans</i>	5-10	0.00	0.00
Canada wildrye	<i>Elymus canadensis</i>	1-7	1.24	0.70
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.00	0.00
buffalograss	<i>Buchloe dactyloides</i>	1-3	5.39	1.24
sideoats grama	<i>Bouteloua curtipendula</i>	0-5	9.96	1.30
slender wheatgrass	<i>Elymus trachycaulus</i>	0-5	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	0-1	0.00	0.00
prairie junegrass	<i>Koeleria macrantha</i>	0-1	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	0-1	0.41	0.41
sand dropseed	<i>Sporobolus cryptandrus</i>	0-1	0.00	0.00
prairie sandreed	<i>Calamovilfa longifolia</i>	0-1	0.00	0.00
sixweeks fescue	<i>Vulpia octoflora</i>	0-1	0.00	0.00
tall dropseed	<i>Sporobolus compositus</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
<b>Other native grasses</b>		1-5	0.83	0.83
inland saltgrass	<i>Distichlis spicata</i>		0.41	0.41
tumblegrass	<i>Schedonnardus paniculatus</i>		0.41	0.41
<b>Forbs</b>		5-10	60.58	14.10
American vetch	<i>Vicia americana</i>	1-2	0.00	0.00
rag sumpweed	<i>Iva xanthifolia</i>	1-2	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	1-2	10.79	1.27
Missouri goldenrod	<i>Solidago missouriensis</i>	0-2	0.00	0.00
curlycup gumweed	<i>Grindelia squarrosa</i>	0-1	0.83	0.58
false boneset	<i>Brickellia eupatorioides</i>	0-1	0.00	0.00
hairy goldenaster	<i>Heterotheca villosa</i>	0-1	0.00	0.00
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.41	0.41
Missouri milkvetch	<i>Astragalus missouriensis</i>	0-1	0.00	0.00
narrowleaf poisonvetch	<i>Astragalus pectinatus</i>	0-1	0.00	0.00
prairie larkspur	<i>Delphinium carolinianum</i>	0-1	0.00	0.00

prairie groundsel	<i>Packera plattensis</i>	0-1	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	0-1	0.00	0.00
scarlet gaura	<i>Gaura coccinea</i>	0-1	0.41	0.41
scarlet globemallow	<i>Sphaeralcea coccinea</i>	0-1	0.41	0.41
slimflower scurfpea	<i>Psoraleidum tenuiflorum</i>	0-1	5.39	1.24
western ragweed	<i>Ambrosia psilostachya</i>	0-1	0.00	0.00
<b>Other native forbs</b>		1-5	36.93	8.00
common groundcherry	<i>Physalis longifolia</i>		1.24	0.70
common sunflower	<i>Helianthus annuus</i>		0.41	0.41
fetid marigold	<i>Dyssodia papposa</i>		0.83	0.58
heath aster	<i>Symphotrichum ericoides</i>		2.49	0.95
poison milkweed	<i>Asclepias subverticillata</i>		0.41	0.41
prostrate vervain	<i>Verbena bracteata</i>		0.83	0.58
short-ray prairie coneflower	<i>Ratibida tagetes</i>		9.96	1.30
snow on the mountain	<i>Euphorbia marginata</i>		0.41	0.41
stiff flax	<i>Linum rigidum</i>		0.41	0.41
thyme-leaved spurge	<i>Chamaesyce serpyllifolia</i> ssp. <i>serpyllifolia</i>		1.24	0.70
wavyleaf thistle	<i>Cirsium undulatum</i>		1.24	0.70
white prairie clover	<i>Dalea candida</i>		0.41	0.41
winecup	<i>Callirhoe involucrata</i>		16.60	0.00
woolly Indianwheat	<i>Plantago patagonica</i>		0.41	0.41
<b>Non native forbs</b>		0	5.39	1.77
field bindweed	<i>Convolvulus arvensis</i>		4.56	1.19
Russian thistle	<i>Salsola iberica</i>		0.83	0.58
<b>Unidentified forbs</b>				
UF10	<i>Chenopodiaceae</i>		1.24	0.70
UF12	<i>Fabaceae</i>		0.41	0.41
<b>Shrubs</b>		5-15	0.00	0.00
fourwing saltbush	<i>Atriplex canescens</i>	5-15	0.00	0.00
winterfat	<i>Krascheninnikovia lanata</i>	1-5	0.00	0.00
fringed sagebrush	<i>Artemisia frigida</i>	0-1	0.00	0.00
green plume rabbitbrush	<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>glabrata</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.00	0.00
rubber rabbitbrush	<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-3	0.00	0.00

<b>Ground Cover</b>	
Type	% Cover
Plant	33.75
Litter	65.83
Bare	0.42
Rock	0.00
n	360

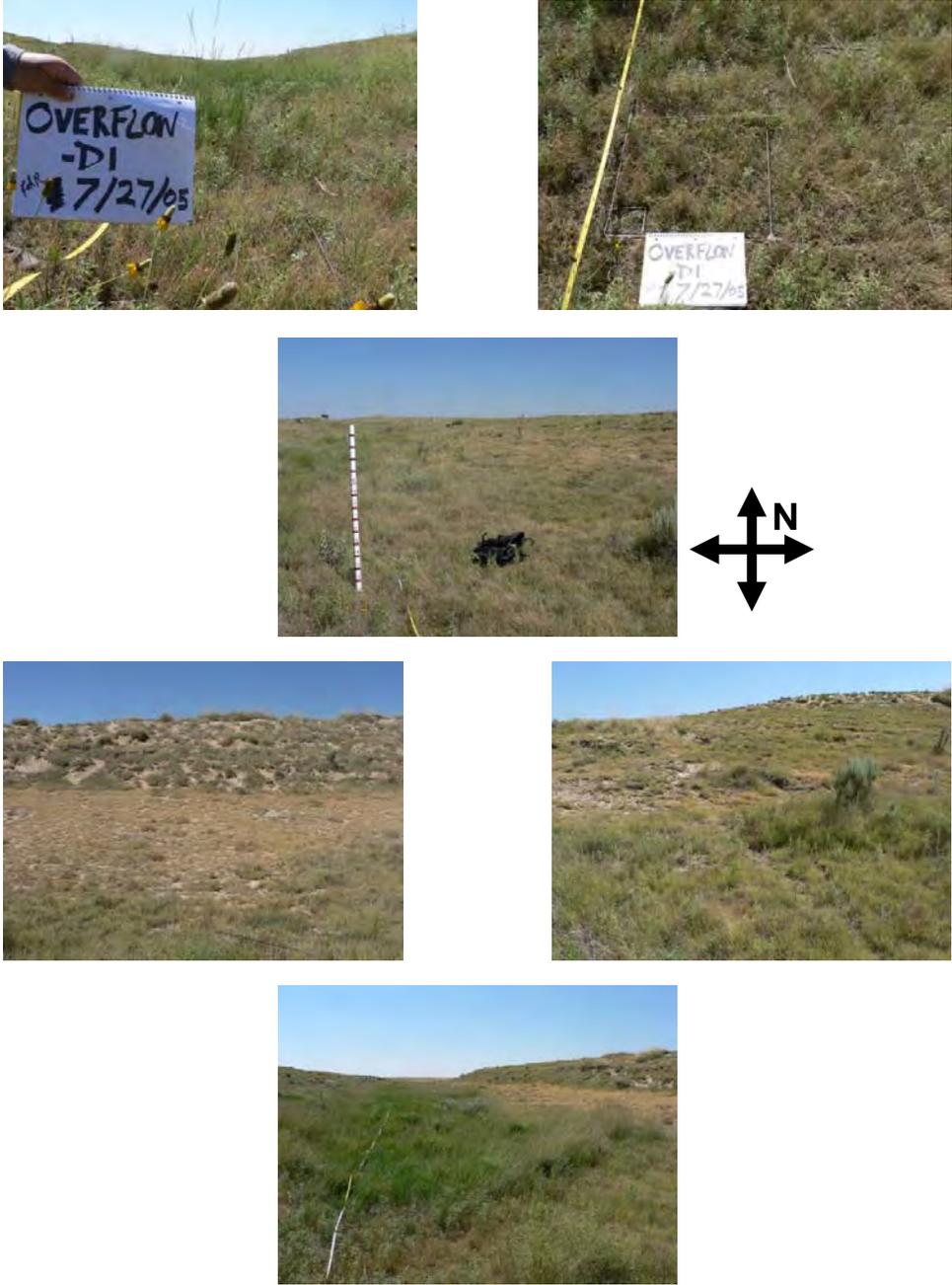


**Figure 39: Overflow D Plant Group Composition** - This graph depicts the current plant group composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that plant group on the Ecological Site. The yellow is the current group composition.



**Figure 38: Overflow D Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

**Overflow D**



**Figure 40: Photographs of Overflow D** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Saline Overflow:

**Site Type:** Rangeland

**Site Name:** Saline Overflow

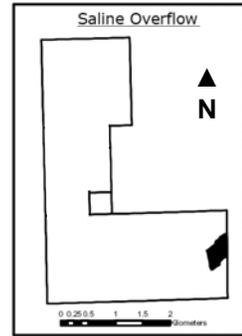
**Site ID:** R067BY037CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**Soil Classification:** Fluvaquent\*

### ***Physiographic Features***

This site occurs on level to gently sloping slopes. Landform is a drainage way. Flooding is none to occasional with a maximum duration of brief. There is no significant ponding on this site. The runoff class is medium to high.



### ***Soil Features***

The soils of this site are very deep, well drained, and moderately slowly and slowly permeable. These soils occur on drainage ways. Some soils have salts or alkali in the substratum or underlying material. The available water capacity is typically moderate. The soil surface layer is typically 4 to 20 inches thick.

The Historic Climax Plant Community (HCPC) 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. Sub-surface soil layers are non-restrictive to water movement and root penetration.

Major soil series correlated to this Ecological Site include: Manzanola\*

Other soil series that have been correlated to this site include: Haverson

**Parent Material Kind:** alluvium

**Parent Material Origin:** shale, clayey

**Surface Texture:** clay loam, silty clay loam

**Surface Texture Modifier:** none

**Subsurface Texture Group:** clayey

**Surface Fragments < 3" (% Cover):** 0

**Surface Fragments > 3" (%Cover):** 0

**Subsurface Fragments < 3" (% Volume):** 0 - 15

**Subsurface Fragments > 3" (% Volume):** 0

**Drainage Class:** well

**Permeability Class:** slow - moderately slow

**Depth (inches):** 60 - 80

**Electrical Conductivity (mmhos/cm)\*\*:** 0 - 8

**Sodium Absorption Ratio\*\*:** 0

**Soil Reaction (1:1 Water)\*\*:** 7.4 - 9.0

**Available Water Capacity (inches)\*\*:** 6.5 - 8.0

**Calcium Carbonate Equivalent (percent)\*\*:** 5 - 15

### ***Historic Climax Plant Community:***

\* A complete soil classification table for Kiowa County is located in Appendix E.

\*\*These attributes represent 0-40 inches in depth or to the first restrictive layer.

The historic climax plant community (description follows) has been determined by study of rangeland relic areas, areas protected from excessive disturbance, seasonal use pastures, short durational/time controlled grazing and historical accounts.

The plant community described should not necessarily be thought of as the “Desired Plant Community”. According to the USDA NRCS National Range and Pasture Handbook, Desired Plant Communities will be determined by the decision-makers and will meet minimum quality criteria established by the NRCS. The main purpose for, including any description of a plant community here is to capture the current knowledge and experience at the time.

**Alkali Sacaton, Western Wheatgrass, Switchgrass, Fourwing saltbush Plant Community**

The interpretive plant community for this site is the Historic Climax Plant Community (HCPC). This community developed with grazing by large herbivores and is well suited for grazing by domestic livestock and can be found on areas that are properly managed with prescribed grazing that allows for adequate recovery periods between grazing events. The potential vegetation is about 75-90% grasses and grass-likes, 5-10% forbs and 5-15% shrubs by air-dry weight. Dominant grasses include alkali sacaton, western wheatgrass and switchgrass. Grasses of secondary importance are blue grama, vine mesquitegrass (south) and inland saltgrass. Sun sedge is common. Forbs and shrubs such as American vetch, American licorice, Fremont goldenweed, scarlet globemallow and fourwing saltbush are significant.

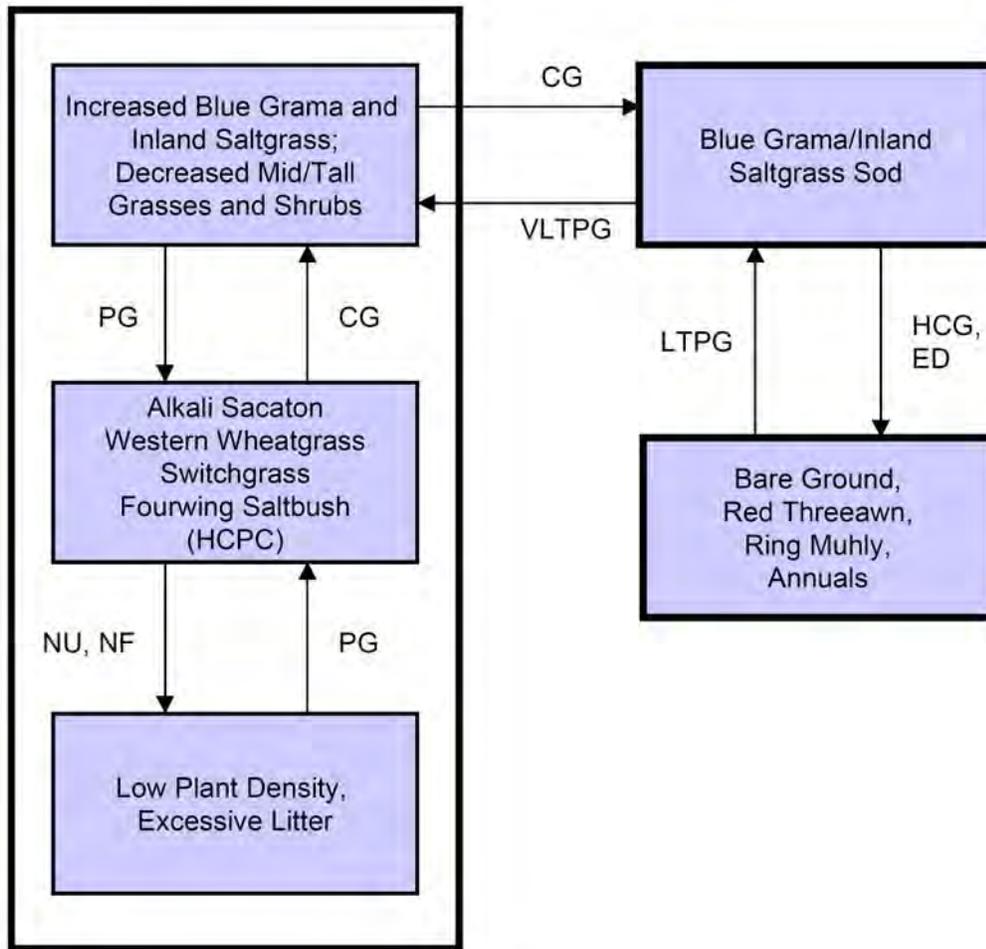
This plant community is diverse, stable, and productive. Litter is properly distributed with very little movement and natural plant mortality is low. It is well suited to carbon sequestration, water yield, wildlife use by many species, livestock use and is esthetically pleasing. Community dynamics, nutrient cycle, water cycle and energy flow are functioning properly. This community is resistant to many disturbances except continuous grazing, tillage and/or development into urban or other uses.

Total annual production ranges from 800 to 2800 pounds of air-dry vegetation per acre and will average 1700 pounds during an average year.

***Plant Communities and Transitional Pathways***

Continuous grazing without adequate recovery periods following each grazing occurrence causes this site to deteriorate. Species such as blue grama and inland saltgrass will increase. Alkali sacaton, switchgrass, green needlegrass and western wheatgrass will decrease in frequency and production as well as American vetch and fourwing saltbush. Further continuous grazing will cause blue grama and inland saltgrass to form into a sodbound condition. Heavy continuous grazing or excessive defoliation will eventually result in a plant community consisting of various low successional perennials, annuals and increased bare ground. Excessive rest or non-use and/or lack of fire will result in a plant community having high litter levels with low plant density.

The following diagram illustrates the common plant communities that can occur on the site and the transition pathways (arrows) among communities. Bold lines surrounding each plant community or communities represent ecological thresholds (USDA, NRCS 2004). The ecological processes are discussed in more detail in the Ecological Site Description from the NRCS Field Office Technical Guide.



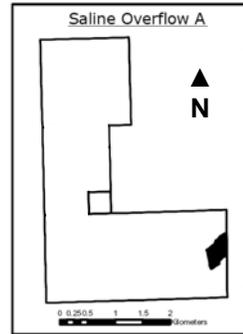
**CG** - continuous grazing without adequate recovery opportunity, **ED** - excessive defoliation, **HCG** - heavy continuous grazing, **HCPC** - Historic Climax Plant Community, **LTPG** - long-term prescribed grazing (>40 years), **NF, NU** - no fire, non-use, **PG** - prescribed grazing with adequate recovery opportunity, **VLTPG** - very long term prescribed grazing (>80 years)

**Figure 41: Saline Overflow State and Transition Model** - Diagram of the Saline Overflow Ecological Site MRLA 67B community states and transitions (USDA, NRCS 2004).

## Saline Overflow Early Seral

### Saline Overflow A

The Saline Overflow A stratum is located on southeast portion of the property. Saline Overflow A is east of Sand Creek and occupies NPS land on section 30 T17S R45W. Saline Overflow A has an active prairie dog town that continues onto section 29 T17S R45W owned by Burl M. & Catherine R. Scherler.



This area has transitioned to a **Red Threeawn, Ring Muhly, Annuals with Increased Bare Ground Plant Community**, a state usually reached through heavy continuous grazing or excessive defoliation. One dominant grass, blue grama, was detected but at reduced levels of the HCPC at 2.21% ( $\pm 0.69$ ). The other dominant grasses, alkali sacaton, western wheatgrass, vine mesquite, and switchgrass, were not detected. The current dominant grass species were detected at 10.57% ( $\pm 0.86$ ) red threeawn, 7.86% ( $\pm 0.96$ ) tumblegrass, and 5.90% ( $\pm 0.94$ ) buffalograss. The HCPC dominant forbs, American vetch, American licorice, and Fremont goldenweed, were not detected. The current dominant forb species were detected at a relative abundance of 10.57% ( $\pm 0.86$ ) scarlet globemallow, 10.32% ( $\pm 0.88$ ) woolly Indianwheat, 9.09% ( $\pm 0.93$ ) silky crazyweed, 5.90% ( $\pm 0.94$ ) povertyweed, and 5.16% ( $\pm 0.92$ ) kochia. The dominant shrubs of the HCPC, fourwing saltbush and black greasewood, were not detected. Purple pincushion, green rabbitbrush, and sand sagebrush were detected at acceptable levels for the HCPC at 0.25% ( $\pm 0.25$ ), 0.25% ( $\pm 0.25$ ), and 0.25% ( $\pm 0.25$ ), respectively.

The Red Threeawn, Ring Muhly, Annuals with Increased Bare Ground Plant Community is an extremely degraded condition. This community has witnessed large decrease in production. Energy, nutrient, and water cycles have been greatly impaired. Litter levels are very low and erosion is of great concern. Although many of the dominant species of the HCPC are not found within the Saline Overflow A stratum, most of the species are found within the SCMNHs. Species not found on the SCMNHs include: American vetch, Fremont goldenweed, and fourwing saltbush. However, these species may be present on neighboring lands.

## Saline Overflow A

**Site Type:** Rangeland

**Site Name:** Overflow

**Site ID:** R067BY036CO

**Major Land Resource Area:** 67b - Central High Plains, Southern Part

**n :** 60

**Date:** June 2005

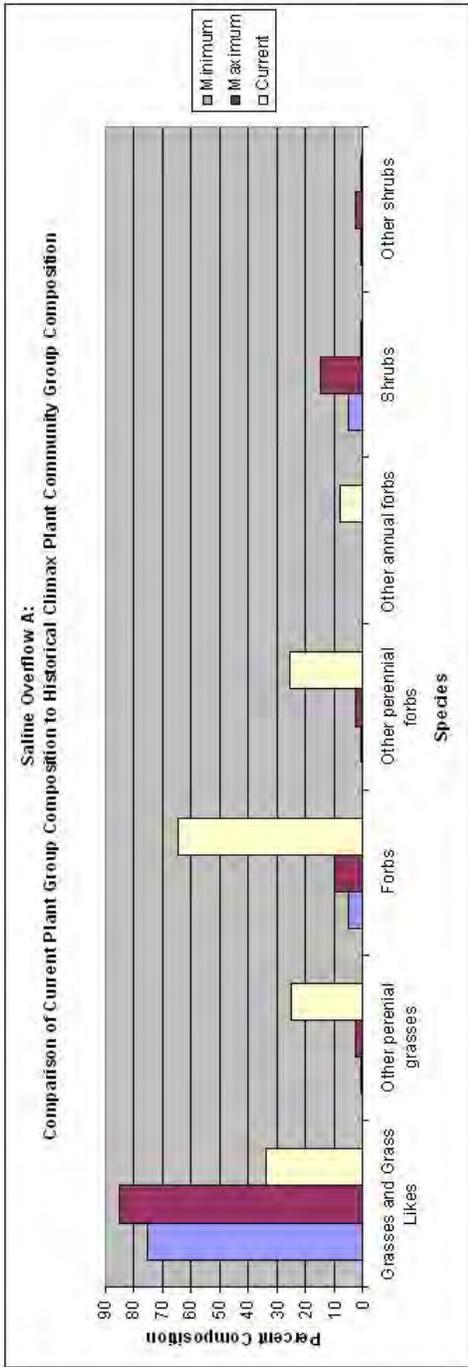
**Table 16: Saline Overflow A Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>		<b>75-90</b>	<b>33.91</b>	<b>5.39</b>
alkali sacaton	<i>Sporobolus airoides</i>	25-35	0.00	0.00
western wheatgrass	<i>Pascopyrum smithii</i>	15-25	0.00	0.00
blue grama	<i>Bouteloua gracilis</i>	15-25	2.21	0.69
switchgrass	<i>Panicum virgatum</i>	5-10	0.00	0.00
vine mesquite	<i>Panicum obtusum</i>	5-10	0.00	0.00
buffalograss	<i>Buchloe dactyloides</i>	1-5	5.90	0.94
inland saltgrass	<i>Distichlis spicata</i>	1-5	0.00	0.00
big bluestem	<i>Andropogon gerardii</i>	0-5	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	1-3	0.00	0.00
green needlegrass	<i>Nassella viridula</i>	0-3	0.00	0.00
alkali cordgrass	<i>Spartina gracilis</i>	0-2	0.00	0.00
Canada wildrye	<i>Elymus canadensis</i>	0-2	0.00	0.00
little bluestem	<i>Schizachyrium scoparium</i>	0-2	0.00	0.00
sand dropseed	<i>Sporobolus cryptandrus</i>	0-2	0.00	0.00
bottlebrush squirreltail	<i>Elymus elymoides</i>	0-1	0.00	0.00
galleta	<i>Hilaria jamesii</i>	0-1	0.00	0.00
ring muhly	<i>Muhlenbergia torreyi</i>	0-1	0.49	0.34
sixweeks fescue	<i>Vulpia octoflora</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-3	0.00	0.00
<b>Other perennial grasses</b>		<b>1-3</b>	<b>25.31</b>	<b>3.42</b>
red threeawn	<i>Aristida purpurea</i>		10.57	0.86
tumblegrass	<i>Schedonnardus paniculatus</i>		7.86	0.96
UGA			2.46	0.72
UGB			4.42	0.88
<b>Forbs</b>		<b>5-10</b>	<b>64.37</b>	<b>14.55</b>
American vetch	<i>Vicia americana</i>	1-3	0.00	0.00
American licorice	<i>Glycyrrhiza lepidota</i>	1-2	0.00	0.00
Fremont goldenweed	<i>Oenopsis foliosa var. foliosa</i>	1-2	0.00	0.00
scarlet globemallow	<i>Sphaeralcea coccinea</i>	0-2	10.57	0.86
Colorado greenthread	<i>Thelesperma filifolium</i>	0-1	0.00	0.00
cutleaf evening-primrose	<i>Oenothera coronopifolia</i>	0-1	0.00	0.00
dotted gayfeather	<i>Liatris punctata</i>	0-1	0.00	0.00
hairy goldenaster	<i>Heterotheca villosa</i>	0-1	0.00	0.00
heath aster	<i>Symphotrichum ericoides</i>	0-1	0.00	0.00

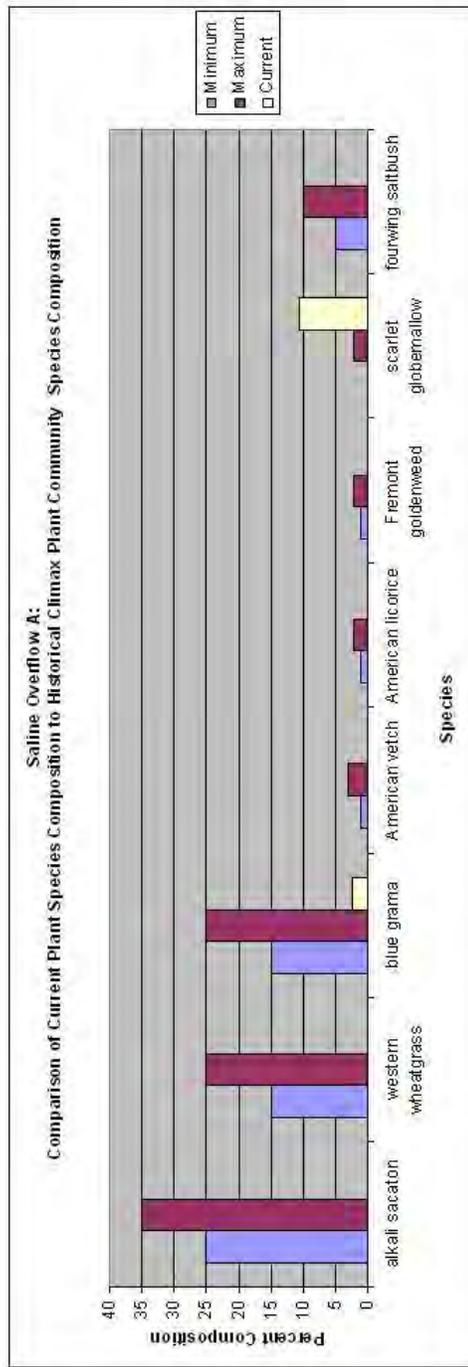
ironplant goldenweed	<i>Haplopappus spinulosus</i>	0-1	0.00	0.00
Lambert crazyweed	<i>Oxytropis lambertii</i>	0-1	0.00	0.00
narrowleaf penstemon	<i>Penstemon angustifolius</i>	0-1	0.00	0.00
povertyweed	<i>Iva axillaris</i>	0-1	5.90	0.94
purple prairie clover	<i>Dalea purpurea</i>	0-1	0.00	0.00
rush skeletonplant	<i>Lygodesmia juncea</i>	0-1	0.49	0.34
silky crazyweed	<i>Oxytropis sericea</i>	0-1	0.00	0.00
slimflower scurfpea	<i>Psoraleidium tenuiflorum</i>	0-1	1.23	0.53
twogrooved milkvetch	<i>Astragalus bisulcatus</i>	0-1	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	0-1	0.00	0.00
variable senecio	<i>Packera neomexicana var. mutabilis</i>	0-1	0.00	0.00
western ragweed	<i>Ambrosia psilostachya</i>	0-1	2.46	0.72
woolly Indianwheat	<i>Plantago patagonica</i>	0-1	10.32	0.88
<b>Other perennial forbs</b>		1-5	25.55	8.11
Astragalus sp.	<i>Astragalus sp.</i>		0.25	0.25
buffalo-gourd	<i>Cucurbita foetidissima</i>		0.49	0.34
conyza	<i>Conyza canadensis</i>		1.72	0.62
ironplant goldenweed	<i>Haplopappus spinulosus</i>		1.97	0.65
groundplum milkvetch	<i>Astragalus crassicaupus</i>		0.25	0.25
groundsel	<i>Senecio integerrimus</i>		0.25	0.25
poison milkweed	<i>Asclepias subverticillata</i>		0.49	0.34
prostrate vervain	<i>Verbena bracteata</i>		2.21	0.69
scarlet gaura	<i>Gaura coccinea</i>		1.47	0.58
snow on the mountain	<i>Euphorbia marginata</i>		1.72	0.62
stiff flax	<i>Linum rigidum</i>		2.46	0.72
stinking milkvetch	<i>Astragalus praelongus var. ellisiae</i>		0.49	0.34
narrowleaf poisonvetch	<i>Astragalus pectinatus</i>		0.98	0.48
wallflower	<i>Erysimum asperum</i>		0.98	0.48
wavyleaf thistle	<i>Cirsium undulatum</i>		0.49	0.34
silky crazyweed	<i>Oxytropis sericea</i>		9.09	0.93
winecup	<i>Callirhoe involucrata</i>		0.25	0.25
<b>Other annual forbs</b>		0	7.86	2.16
beggars tick	<i>Cryptantha circumscissa</i>		1.97	0.65
Chenopodium sp.	<i>Chenopodium sp.</i>		0.49	0.34
flatspine stickseed	<i>Lappula echinata var. occidentalis</i>		0.25	0.25
kochia	<i>Kochia scoparia</i>		5.16	0.92
<b>Unidentified forbs</b>				
UF99	<i>Brassicaceae</i>		0.98	0.48
<b>Shrubs</b>		5-15	0.74	0.74
fourwing saltbush	<i>Atriplex canescens</i>	5-10	0.00	0.00
broom snakeweed	<i>Gutierrezia sarothrae</i>	0-1	0.00	0.00
fringed sagebrush	<i>Artemisia frigida</i>	0-1	0.00	0.00
green plume rabbitbrush	<i>Ericameria nauseosa ssp. nauseosa var. glabrata</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.00	0.00
walking stick cholla	<i>Opuntia imbricata</i>	0-1	0.00	0.00
<b>Other shrubs</b>		1-3	0.74	0.74
green rabbitbrush	<i>Chrysothamnus viscidiflorus</i>		0.25	0.25
purple pincushion	<i>Escobaria vivipara var. vivipara</i>		0.25	0.25

sand sagebrush	<i>Artemisia filifolia</i>		0.25	0.25
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Ground Cover	
Type	% Cover
Plant	25.56
Litter	33.89
Bare	40.56
Rock	0.00
n	360



**Figure 43: Saline Overflow A Plant Group Composition** - This graph depicts the current plant group composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that plant group on the Ecological Site. The yellow is the current group composition.



**Figure 42: Saline Overflow A Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

## Saline Overflow A



**Figure 44: Photographs of Saline Overflow A** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.



## Salt Meadow:

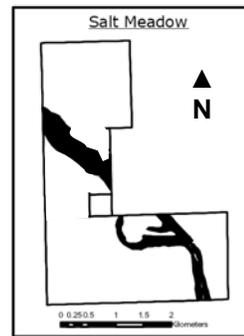
**Site Type:** Rangeland

**Site Name:** Salt Meadow

**Site ID:** R067BY035CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**Soil Classification:** Fluvaquent\*



### **Physiographic Features**

This site occurs on floodplains level to gently sloping slopes. Flooding is rare to occasional with a duration of brief to very brief. This site has no significant ponding with a runoff class of low to high.

### **Influencing Water Features**

This Ecological Site has a combination of physical and hydrological features that: 1) provide season-long ground water within 3.5 feet of the surface, 2) allows relatively free movement of water and air in the upper part of the soil, and 3) are rarely, or occasionally flooded.

### **Wetland Description: System Subsystem Class Sub-class**

Cowardin, et al., 1979 Palustrine N/A Emergent Wetland Persistent

### **Soil Features**

The soils of this site are very deep, poorly to somewhat poorly drained, and slowly to moderate rapidly permeable. These soils occur on floodplains. Some soils have 0-15% rock fragments in underlying material. The available water capacity is typically low to moderate. The soil surface layer is typically 6 to 24 inches thick.

The Historic Climax Plant Community (HCPC) 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. Sub-surface soil layers are non-restrictive to water movement and root penetration.

Major soil series correlated to this Ecological Site include: Apishapa, Heldt saline, Limon saline, Loveland, Wann saline, Las saline, Alda var., and Wann

**Parent Material Kind:** alluvium

**Parent Material Origin:** mixed

**Surface Texture:** clay loam, loam, fine sandy loam

**Surface Texture Modifier:** none

**Subsurface Texture Group:** loamy

**Surface Fragments < 3" (% Cover):** 0

**Surface Fragments > 3" (%Cover):** 0

**SubSurface Fragments < 3" (% Volume):** 0 - 15

**Subsurface Fragments > 3" (% Volume):** 0

**Drainage Class:** poorly - somewhat poorly

**Permeability Class:** slow - moderately rapid

**Depth (inches):** 60 - 80

**Electrical Conductivity (mmhos/cm)\*\*:** 2 - 16

**Sodium Absorption Ratio\*\*:** 5 - 30

**Soil Reaction (1:1 Water)\*\*:** 7.4 - 9.0

**Available Water Capacity (inches)\*\*:** 4.5 - 6.5

**Calcium Carbonate Equivalent (percent)\*\*:** 0 - 10

### **Historic Climax Plant Community:**

\* A complete soil classification table for Kiowa County is located in Appendix E.

\*\*These attributes represent 0-40 inches in depth or to the first restrictive layer.

The historic climax plant community (description follows) has been determined by study of rangeland relic areas, areas protected from excessive disturbance, seasonal use pastures, short durational/time controlled grazing and historical accounts.

The plant community described should not necessarily be thought of as the "Desired Plant Community". According to the USDA NRCS National Range and Pasture Handbook, Desired Plant Communities will be determined by the decision-makers and will meet minimum quality criteria established by the NRCS. The main purpose for, including any description of a plant community here is to capture the current knowledge and experience at the time.

#### **Alkali Sacaton, Western Wheatgrass, Switchgrass, Prairie Cordgrass Plant Community**

This plant community is the interpretive plant community for this site and is considered to be the Historic Climax Plant Community (HCPC). This community evolved with grazing by large herbivores and is well suited for grazing by domestic livestock. Historically, fires occurred infrequently. This plant community can be found on areas that are grazed and where the grazed plants receive adequate periods of recovery during the growing season. The potential vegetation is about 80-95% grasses and grass-likes, 3-10% forbs and 2-10% woody plants.

The community is dominated by tall and mid warm and cool season grasses. Major grasses include alkali sacaton, switchgrass, prairie cordgrass and western wheatgrass. Other grasses and grass-likes occurring on the community include alkali bluegrass, big bluestem, little bluestem, alkali cordgrass, Baltic rush and Nebraska sedge. Key forbs and shrubs include American licorice, prairie gentian, rag sumpweed, rubber rabbitbrush and fourwing saltbush.

This plant community is stable and well adapted to the Northern Great Plains. The high water table supplies much of the moisture for plant growth. Plant litter is properly distributed with little movement and natural plant mortality is very low. This is a sustainable plant community in terms of soil stability, watershed function and biologic integrity.

Total annual production ranges from 2000 to 4000 pounds of air-dry vegetation per acre and will average 3000 pounds during an average year.

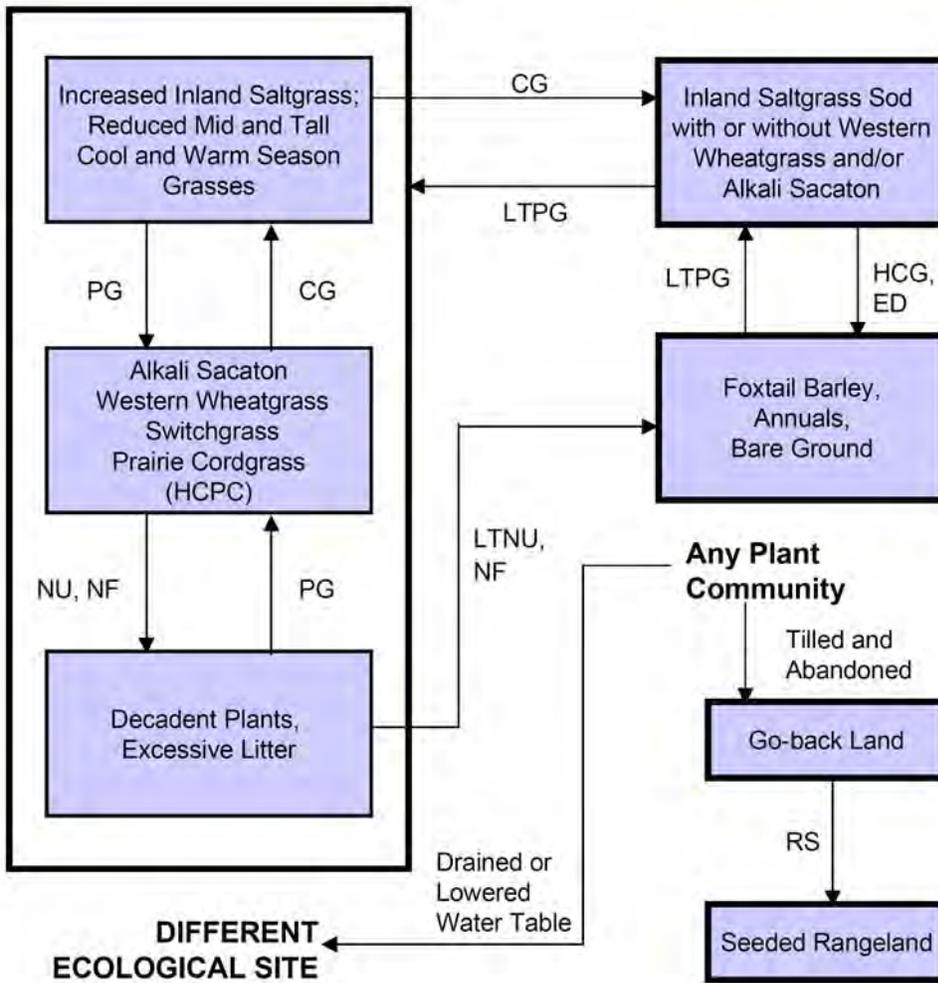
#### ***Plant Communities and Transitional Pathways***

Continuous grazing without adequate recovery periods following each grazing occurrence will cause prairie cordgrass, switchgrass, alkali sacaton and eventually western wheatgrass to decrease in frequency and production while inland saltgrass increases. In time, the plant community will become dominated by inland saltgrass and develop into a sodbound condition with alkali sacaton and western wheatgrass persisting in remnant amounts. Heavy continuous grazing will ultimately result in a plant community dominated by foxtail barley, annual invaders and increased bare ground. Excessive litter, plant mortality and decadence can result from the lack of fire and/or non-use. Extended periods of non-use (rest), lack of fire or heavy long term continuous grazing can lead to increase bare ground.

Tillage or any type of mechanical treatment is not recommended on this site since it will increase inland saltgrass.

Irrigation (pumping) or drainage will cause water table levels to drop. Sustained reduction in water table levels will cause a different Ecological Site to develop.

The following diagram illustrates the common plant communities that can occur on the site and the transition pathways (arrows) among communities. Bold lines surrounding each plant community or communities represent ecological thresholds (USDA, NRCS 2004). The ecological processes are discussed in more detail in the Ecological Site Description from the NRCS Field Office Technical Guide.

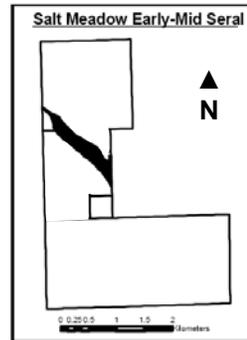


**CG** - continuous grazing without adequate recovery opportunity; **ED** - excessive defoliation; **HCG** - heavy continuous grazing; **HCPC** - Historic Climax Plant Community; **LTNU** - long term non-use (>40 years); **LTPG** - long term prescribed grazing (>40 years); **NF, NU** - no fire, non-use; **PG** - prescribed grazing with adequate recovery opportunity; **RS** - range seeding

**Figure 45: Salt Meadow State and Transition Model** - Diagram of the Salt Meadow Ecological Site MRLA 67B community states and transitions (USDA, NRCS 2004).

## Salt Meadow Early-Mid Seral

This area has transitioned to an **Increased Inland Saltgrass; Reduced Mid and Tall, Cool and Warm Season Grasses Plant Community**, a state usually reached through continuous grazing. This stratum has also seen a change in the plant community potential possibly caused by a drop in the water table. The lowering of the water has created a new climax plant community. Two dominant grasses, alkali sacaton and western wheatgrass, were detected but at reduced levels of the HCPC at 7.79% ( $\pm 0.59$ ) and 1.12% ( $\pm 0.28$ ), respectively. The other dominant grasses, switchgrass and prairie cordgrass, were not detected. The current dominant grass species were detected at 14.16% ( $\pm 0.54$ ) blue grama, 7.79% ( $\pm 0.59$ ) alkali sacaton, 5.17% ( $\pm 0.53$ ) inland saltgrass, and 5.09% ( $\pm 0.53$ ) hairy grama. The dominant forb of the HCPC, American licorice, was not detected. The current dominant forb species were detected at a relative abundance of 8.76% ( $\pm 0.60$ ) Russian thistle, 5.62% ( $\pm 0.55$ ) scarlet globemallow, 5.24% ( $\pm 0.54$ ) conyza, 3.30% ( $\pm 0.45$ ) short-ray prairie coneflower, and 3.22% ( $\pm 0.45$ ) stiff flax. The dominant shrubs of the HCPC, fourwing saltbush and rubber rabbitbrush, were not detected. Sand sagebrush was the dominant shrub at 1.57% ( $\pm 0.33$ ).



The Increased Inland Saltgrass; Reduced Mid and Tall, Cool and Warm Season Grasses Plant Community is at risk of losing tallgrass species and has lost important forbs and shrubs. This community has reduced production and is very resistant to change. Resistance to change depends on invasion of inland saltgrass; Salt Meadow Early-Mid Seral currently supports slightly more saltgrass as than the HCPC. Russian thistle was found at high levels in this stratum. Although many of the dominant species of the HCPC are not found within the Salt Meadow Early-Mid Seral stratum, most of the species are found within the SCMNHs. Species not found on the SCMNHs include: alkali bluegrass, big bluestem, alkali cordgrass, and Nuttalls alkaligrass. However, these species may be present on neighboring lands.

## Salt Meadow Early-Mid Seral

**Site Type:** Rangeland

**Site Name:** Salt Meadow

**Site ID:** R067BY035CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 260

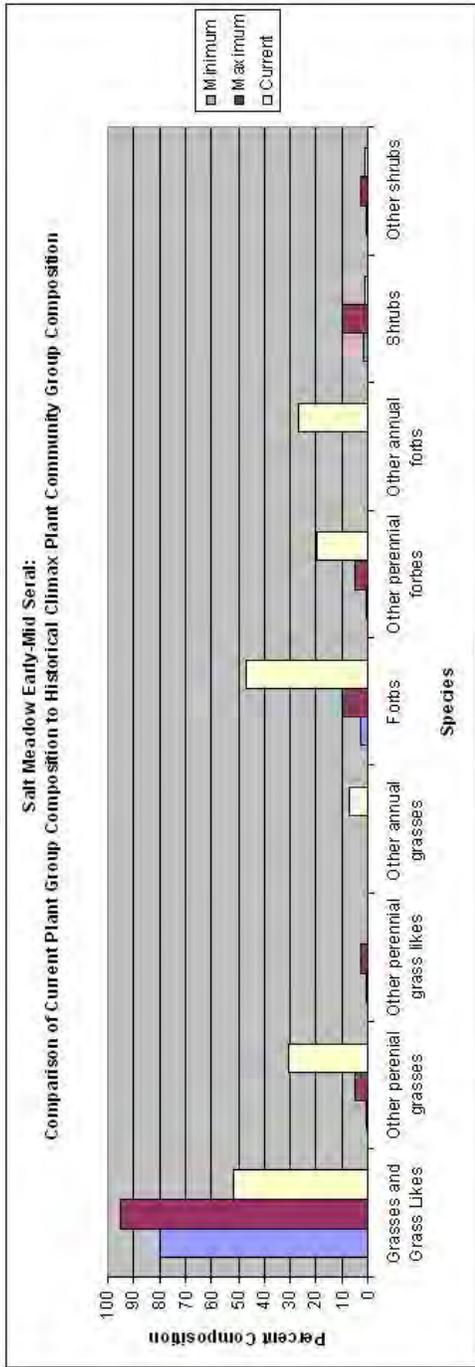
**Date:** June 2005

**Table 17: Salt Meadow Early-Mid Seral Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

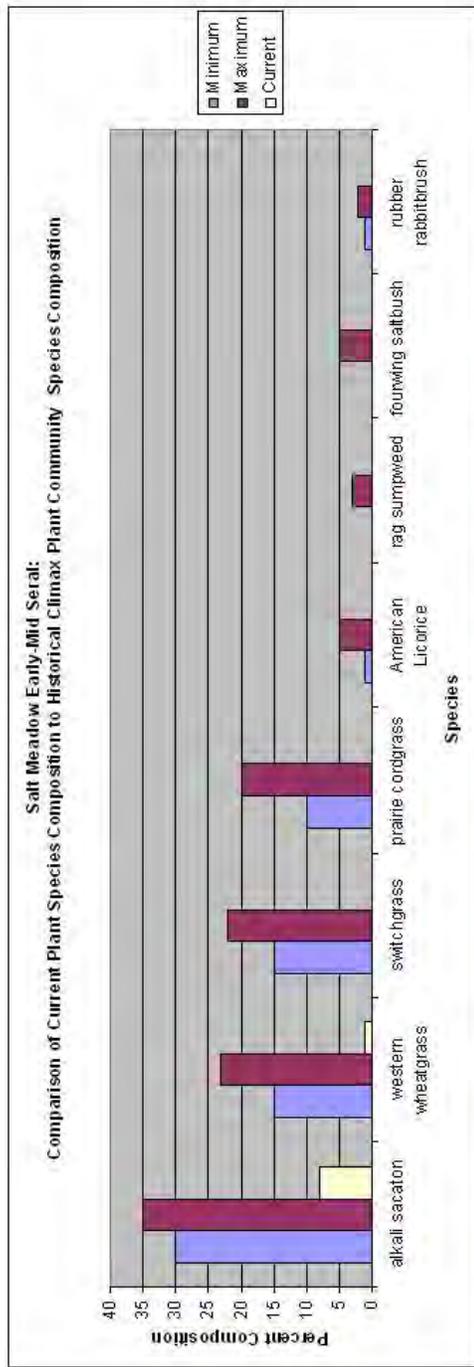
Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>		80-95	51.99	5.64
alkali sacaton	<i>Sporobolus airoides</i>	30-35	7.79	0.59
western wheatgrass	<i>Pascopyrum smithii</i>	15-23	1.12	0.28
switchgrass	<i>Panicum virgatum</i>	15-22	0.00	0.00
prairie cordgrass	<i>Spartina pectinata</i>	10-20	0.00	0.00
alkali bluegrass	<i>Poa secunda</i>	3-10	0.00	0.00
big bluestem	<i>Andropogon gerardii</i>	2-7	0.00	0.00
alkali cordgrass	<i>Spartina gracilis</i>	1-5	0.00	0.00
Canada wildrye	<i>Elymus canadensis</i>	1-5	0.00	0.00
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.00	0.00
yellow Indiangrass	<i>Sorghastrum nutans</i>	0-5	0.00	0.00
inland saltgrass	<i>Distichlis spicata</i>	1-3	5.17	0.53
slender wheatgrass	<i>Elymus trachycaulus</i>	1-3	0.00	0.00
Nuttalls alkaligrass	<i>Puccinellia nuttalliana</i>	1-2	0.00	0.00
vine mesquite	<i>Panicum obtusum</i>	0-2	0.00	0.00
green muhly	<i>Muhlenbergia racemosa</i>	0-1	0.00	0.00
foxtail barley	<i>Hordeum jubatum</i>	0-1	0.00	0.00
Baltic rush	<i>Juncus balticus</i>	1-3	0.00	0.00
Nebraska sedge	<i>Carex nebrascensis</i>	1-3	0.00	0.00
<b>Other perennial grasses</b>		1-5	30.71	2.91
blue grama	<i>Bouteloua gracilis</i>		14.16	0.54
bottlebrush squirreltail	<i>Elymus elymoides</i>		2.17	0.38
buffalograss	<i>Buchloe dactyloides</i>		2.62	0.41
hairy grama	<i>Bouteloua hirsuta</i>		5.09	0.53
red threeawn	<i>Aristida purpurea</i>		1.87	0.36
sand dropseed	<i>Sporobolus cryptandrus</i>		4.34	0.50
tumblegrass	<i>Schedonnardus paniculatus</i>		0.45	0.18
<b>Other perennial grass likes</b>		1-3	0.00	0.00
<b>Other annual grasses</b>		0	7.19	1.33
little annual barley	<i>Hordeum pusillum</i>		2.47	0.40
Panicum sp.	<i>Panicum sp.</i>		0.60	0.21
sixweeks fescue	<i>Vulpia octoflora</i>		3.07	0.44
witchgrass	<i>Panicum capillare</i>		1.05	0.27
<b>Forbs</b>		3-10	46.44	8.28
American licorice	<i>Glycyrrhiza lepidota</i>	1-5	0.00	0.00

rag sumpweed	<i>Iva xanthifolia</i>	0-3	0.00	0.00
showy prairie gentian	<i>Eustoma exaltatum</i> ssp. <i>Russellianum</i>	0-2	0.00	0.00
false boneset	<i>Brickellia eupatorioides</i>	0-1	0.00	0.00
Fremont goldenweed	<i>Oenopsis foliosa</i> var. <i>foliosa</i>	0-1	0.00	0.00
Illinois bundleflower	<i>Desmanthus illinoensis</i>	0-1	0.00	0.00
<b>Other perennial forbs</b>		1-5	19.63	4.27
buffalo-gourd	<i>Cucurbita foetidissima</i>		0.07	0.07
bush morning glory	<i>Ipomoea leptophylla</i>		0.67	0.22
curlycup gumweed	<i>Grindelia squarrosa</i>		0.15	0.11
ironplant goldenweed	<i>Haplopappus spinulosus</i>		0.22	0.13
dotted gayfeather	<i>Liatris punctata</i>		0.37	0.17
hairy fourclock	<i>Mirabilis hirsuta</i>		0.07	0.07
Louisiana sagewort	<i>Artemisia ludoviciana</i>		0.45	0.18
narrowleaf fourclock	<i>Mirabilis linearis</i>		0.15	0.11
Nuttalls evolvulus	<i>Evolvulus nuttallianus</i>		0.07	0.07
prostrate vervain	<i>Verbena bracteata</i>		0.60	0.21
scarlet gaura	<i>Gaura coccinea</i>		2.25	0.39
scarlet globemallow	<i>Sphaeralcea coccinea</i>		5.62	0.55
short-ray prairie coneflower	<i>Ratibida tagetes</i>		3.30	0.45
slimflower scurfpea	<i>Psoraleidum tenuiflorum</i>		0.45	0.18
stiff flax	<i>Linum rigidum</i>		3.22	0.45
stickleaf mentzilia	<i>Mentzelia decapetala</i>		0.07	0.07
UF10	<i>Chenopodiaceae</i>		0.07	0.07
wallflower	<i>Erysimum asperum</i>		0.30	0.15
wavyleaf thistle	<i>Cirsium undulatum</i>		0.90	0.25
western ragweed	<i>Ambrosia psilostachya</i>		0.30	0.15
white prairie clover	<i>Dalea candida</i>		0.07	0.07
winecup	<i>Callirhoe involucrata</i>		0.22	0.13
<b>Other annual forbs</b>		0	26.82	4.01
annual buckwheat	<i>Eriogonum annuum</i>		0.07	0.07
beggars tick	<i>Cryptantha circumscissa</i>		0.75	0.23
flatspine stickseed	<i>Lappula echinata</i> var. <i>occidentalis</i>		1.12	0.28
Chenopodium sp. #1	<i>Chenopodium</i> sp.		0.30	0.15
Chenopodium watsonii	<i>Chenopodium watsonii</i>		0.37	0.17
common sunflower	<i>Helianthus annuus</i>		0.45	0.18
conyza	<i>Conyza canadensis</i>		5.24	0.54
evening primrose	<i>Oenothera</i> spp.		0.15	0.11
fetid marigold	<i>Dyssodia papposa</i>		2.25	0.39
kochia	<i>Kochia scoparia</i>		2.77	0.42
pepperpod mustard	<i>Lepidium densiflorum</i>		2.32	0.39
prickly lettuce	<i>Lactuca serriola</i>		0.15	0.11
Russian thistle	<i>Salsola iberica</i>		8.76	0.60
woolly Indianwheat	<i>Plantago patagonica</i>		2.10	0.38
<b>Shrubs</b>		2-10	1.57	0.33
fourwing saltbush	<i>Atriplex canescens</i>	0-5	0.00	0.00
rubber rabbitbrush	<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>nauseosa</i>	1-2	0.00	0.00
<b>Other shrubs</b>		1-3	1.57	0.33
sand sagebrush	<i>Artemisia filifolia</i>		1.57	0.33

<b>Ground Cover</b>	
Type	% Cover
Plant	48.23
Litter	41.77
Bare	10.00
Rock	0.00
n	1560



**Figure 47: Salt Meadow Early-Mid Seral Plant Group Composition** - This graph depicts the current plant group composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that plant group on the Ecological Site. The yellow is the current group composition.



**Figure 46: Salt Meadow Early-Mid Seral Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

### Salt Meadow Early-Mid Seral



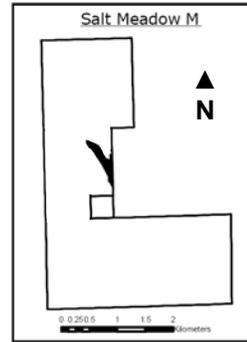
**Figure 48: Photographs of Salt Meadow Early-Mid Seral** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Salt Meadow M

The Salt Meadow M stratum is located on north portion of the property. Salt Meadow M is north of Sand Creek and occupies NPS land on section 24 T17S R46W.

This area has transitioned to an **Increased Inland Saltgrass; Reduced Mid and Tall, Cool and Warm Season Grasses Plant Community**, a state usually reached through continuous grazing. This stratum has also seen a change in the plant community potential possibly caused by a drop in water table. The lowering of the water has created a new climax plant community. Two dominant grasses, alkali sacaton and western wheatgrass, were detected but at reduced levels of the HCPC at 9.07% ( $\pm 0.96$ ) and 3.78% ( $\pm 0.85$ ). The other dominant grasses, switchgrass and prairie cordgrass, were not detected. The current dominant grass species were detected at 14.86% ( $\pm 0.25$ ) blue grama, 11.34% ( $\pm 0.85$ ) inland saltgrass, 9.07% ( $\pm 0.96$ ) alkali sacaton, 5.04% ( $\pm 0.93$ ) sixweeks fescue, and 4.79% ( $\pm 0.92$ ) sand dropseed. The dominant forb of the HCPC, American licorice, was not detected. The current dominant forb species were detected at a relative abundance of 10.83% ( $\pm 0.89$ ) Russian thistle, 10.08% ( $\pm 0.93$ ) conyza, 4.53% ( $\pm 0.90$ ) scarlet globemallow, and 3.27% ( $\pm 0.81$ ) kochia. The dominant shrubs of the HCPC, fourwing saltbush and rubber rabbitbrush, were not detected. Sand sagebrush was the current dominant shrub at 1.01% ( $\pm 0.49$ ).

The Increased Inland Saltgrass; Reduced Mid and Tall, Cool and Warm Season Grasses Plant Community is at risk of losing many tallgrass species and has lost important forbs and shrubs. This community has reduced production and is very resistant to change. Resistance to change is depends on invasion of inland saltgrass; Salt meadow M currently supports three times the amount of saltgrass as the HCPC. Russian thistle and other disturbance annual forbs were found at high levels in this stratum. Although many of the dominant species of the HCPC are not found within the Salt Meadow M stratum, most of the species are found within the SCMNHS. Species not found on the SCMNHS include: alkali bluegrass, big bluestem, alkali cordgrass, and Nuttalls alkaligrass. However, these species may be present on neighboring lands.



## Salt Meadow M

**Site Type:** Rangeland

**Site Name:** Salt Meadow

**Site ID:** R067BY035CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 60

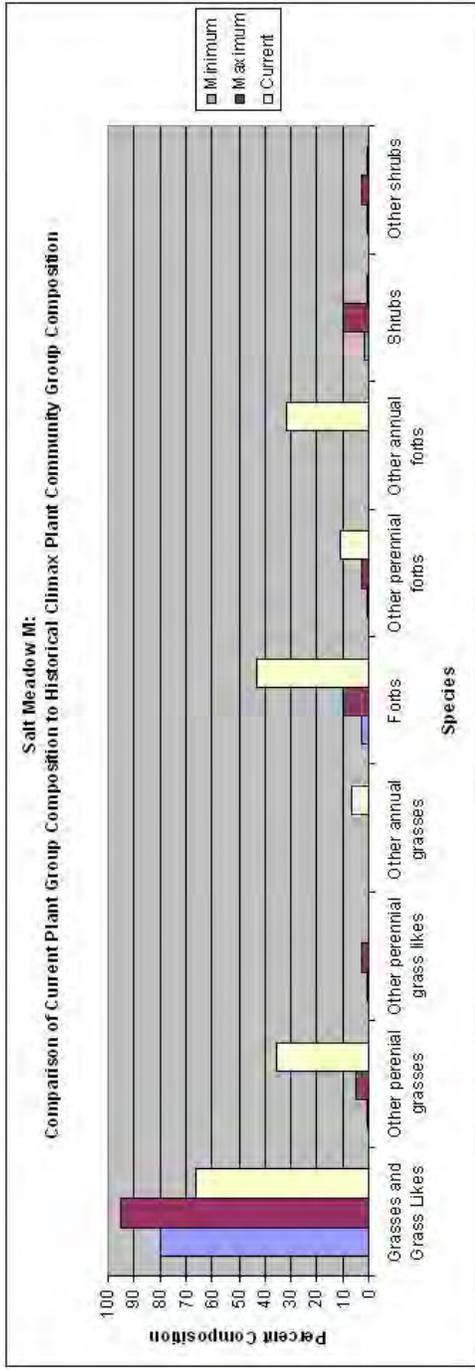
**Date:** June 2005

**Table 18: Salt Meadow M Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

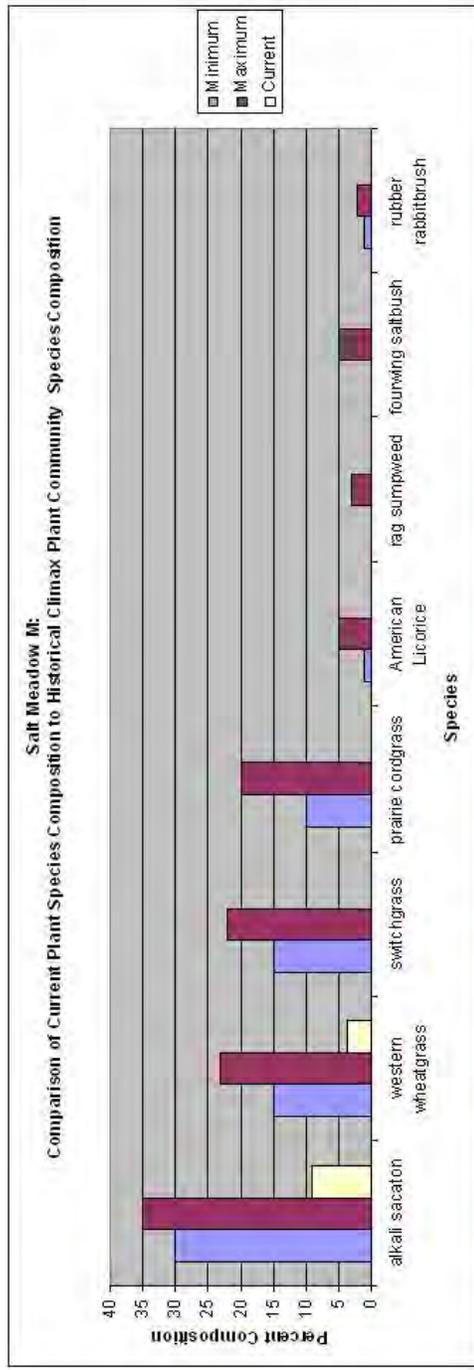
Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>		80-95	66.20	7.34
alkali sacaton	<i>Sporobolus airoides</i>	30-35	9.07	0.96
western wheatgrass	<i>Pascopyrum smithii</i>	15-23	3.78	0.85
switchgrass	<i>Panicum virgatum</i>	15-22	0.00	0.00
prairie cordgrass	<i>Spartina pectinata</i>	10-20	0.00	0.00
alkali bluegrass	<i>Poa secunda</i>	3-10	0.00	0.00
big bluestem	<i>Andropogon gerardii</i>	2-7	0.00	0.00
alkali cordgrass	<i>Spartina gracilis</i>	1-5	0.00	0.00
Canada wildrye	<i>Elymus canadensis</i>	1-5	0.00	0.00
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.00	0.00
yellow Indiangrass	<i>Sorghastrum nutans</i>	0-5	0.00	0.00
inland saltgrass	<i>Distichlis spicata</i>	1-3	11.34	0.85
slender wheatgrass	<i>Elymus trachycaulus</i>	1-3	0.00	0.00
Nuttalls alkaligrass	<i>Puccinellia nuttalliana</i>	1-2	0.00	0.00
vine mesquite	<i>Panicum obtusum</i>	0-2	0.00	0.00
green muhly	<i>Muhlenbergia racemosa</i>	0-1	0.00	0.00
foxtail barley	<i>Hordeum jubatum</i>	0-1	0.00	0.00
Baltic rush	<i>Juncus balticus</i>	1-3	0.00	0.00
Nebraska sedge	<i>Carex nebrascensis</i>	1-3	0.00	0.00
<b>Other perennial grass likes</b>		1-3	0.00	0.00
<b>Other perennial grasses</b>		1-5	35.47	2.90
blue grama	<i>Bouteloua gracilis</i>		24.89	0.25
bottlebrush squirreltail	<i>Elymus elymoides</i>		3.78	0.85
buffalograss	<i>Buchloe dactyloides</i>		1.76	0.63
hairy grama	<i>Bouteloua hirsuta</i>		0.25	0.25
sand dropseed	<i>Sporobolus cryptandrus</i>		4.79	0.92
<b>Other annual grasses</b>		0.00	6.55	1.77
little annual barley	<i>Hordeum pusillum</i>		1.01	0.49
Panicum sp.	<i>Panicum sp.</i>		0.50	0.35
sixweeks fescue	<i>Vulpia octoflora</i>		5.04	0.93
<b>Forbs</b>		3-10	42.82	11.01
American licorice	<i>Glycyrrhiza lepidota</i>	1-5	0.00	0.00
rag sumpweed	<i>Iva xanthifolia</i>	0-3	0.00	0.00
showy prairie gentian	<i>Eustoma exaltatum ssp. Russellianum</i>	0-2	0.00	0.00

false boneset	<i>Brickellia eupatorioides</i>	0-1	0.00	0.00
Fremont goldenweed	<i>Oenopsis foliosa</i> var. <i>foliosa</i>	0-1	0.00	0.00
Illinois bundleflower	<i>Desmanthus illinoensis</i>	0-1	0.00	0.00
<b>Other perennial forbs</b>		1-5	11.08	4.98
hairy fourclock	<i>Mirabilis hirsuta</i>		0.25	0.25
Louisiana sagewort	<i>Artemisia ludoviciana</i>		1.26	0.54
Nuttalls evolvulus	<i>Evolvulus nuttallianus</i>		0.25	0.25
upright prairie coneflower	<i>Ratibida columnifera</i>		0.25	0.25
prostrate vervain	<i>Verbena bracteata</i>		0.25	0.25
scarlet gaura	<i>Gaura coccinea</i>		0.50	0.35
scarlet globemallow	<i>Sphaeralcea coccinea</i>		4.53	0.90
short-ray prairie coneflower	<i>Ratibida tagetes</i>		0.76	0.43
slimflower scurfpea	<i>Psoraleidium tenuiflorum</i>		0.25	0.25
stiff flax	<i>Linum rigidum</i>		0.25	0.25
wallflower	<i>Erysimum asperum</i>		0.25	0.25
wavyleaf thistle	<i>Cirsium undulatum</i>		1.76	0.63
winecup	<i>Callirhoe involucrata</i>		0.50	0.35
<b>Other annual forbs</b>		0	31.74	6.04
annual buckwheat	<i>Eriogonum annuum</i>		0.25	0.25
flatspine stickseed	<i>Lappula echinata</i> var. <i>occidentalis</i>		0.50	0.35
common sunflower	<i>Helianthus annuus</i>		0.25	0.25
conyza	<i>Conyza canadensis</i>		10.08	0.93
evening primrose	<i>Oenothera</i> sp.		0.50	0.35
fetid marigold	<i>Dyssodia papposa</i>		0.76	0.43
kochia	<i>Kochia scoparia</i>		3.27	0.81
pepperpod mustard	<i>Lepidium densiflorum</i>		1.76	0.63
prickly lettuce	<i>Lactuca serriola</i>		0.50	0.35
Russian thistle	<i>Salsola iberica</i>		10.83	0.89
woolly Indianwheat	<i>Plantago patagonica</i>		3.02	0.79
<b>Shrubs</b>		2-10	1.01	0.49
fourwing saltbush	<i>Atriplex canescens</i>	0-5	0.00	0.00
rubber rabbitbrush	<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>nauseosa</i>	1-2	0.00	0.00
<b>Other shrubs</b>		1-3	1.01	0.49
sand sagebrush	<i>Artemisia filifolia</i>		1.01	0.49

Ground Cover	
Type	% Cover
Plant	58.61
Litter	36.11
Bare	5.28
Rock	0.00
n	360.00



**Figure 50: Salt Meadow M Plant Group Composition** - This graph depicts the current plant group composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that plant group on the Ecological Site. The yellow is the current group composition.



**Figure 49: Salt Meadow M Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

## Salt Meadow M



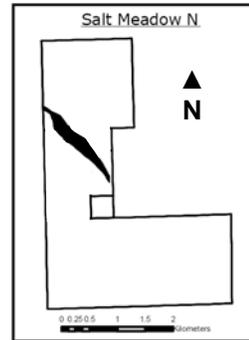
**Figure 51: Photographs of Salt Meadow M** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Salt Meadow N

The Salt Meadow N stratum is located on north portion of the property. Salt Meadow N is north of Sand Creek and occupies NPS land on sections 13 & 24 T17S R46W.

This area has transitioned to a plant community not described by the Ecological Site Descriptions. This stratum has also seen a change in the plant community potential possibly caused by a drop in water table. The lowering of the water has created a new climax plant community. The community is dominated by blue grama, sand dropseed, and annual forbs. Alkali sacaton was the only HCPC dominant grass detected, at a reduced level of 1.42% ( $\pm 0.45$ ). The other dominant grasses, switchgrass, western wheatgrass, and prairie cordgrass, were not detected. The current dominant grass species were detected at 15.75% ( $\pm 0$ ) blue grama, 6.14% ( $\pm 0.77$ ) sand dropseed, 4.41% ( $\pm 0.71$ ) buffalograss, 3.94% ( $\pm 0.69$ ) red threeawn, and 3.78% ( $\pm 0.68$ ) inland saltgrass. The dominant forbs, American licorice and Illinois bundleflower, of the HCPC were not detected. The current dominant forb species were detected at a relative abundance of 11.65% ( $\pm 0.69$ ) Russian thistle, 8.98% ( $\pm 0.78$ ) scarlet globemallow, 4.72% ( $\pm 0.73$ ) conyza, and 4.25% ( $\pm 0.70$ ) fetid marigold. The dominant shrubs of the HCPC, fourwing saltbush and green rabbitbrush, were not detected. Sand sagebrush was the current dominant shrub at 2.68% ( $\pm 0.59$ ).

Salt Meadow N has lost many tallgrass species, important forbs and shrubs. This area is similar to a Foxtail Barley, Annuals, Bare Ground Plant Community in that it has high annual forbs such as Russian thistle and kochia. However, bare ground is limited and wind/water erosion and mineral crusting is not an issue. Although many of the dominant species of the HCPC are not found within the Salt Meadow N stratum, most of the species are found within the SCMNHS. Species not found on the SCMNHS include: alkali bluegrass, big bluestem, alkali cordgrass, and Nuttalls alkaligrass. However, these species may be present on neighboring lands.



## Salt Meadow N

**Site Type:** Rangeland

**Site Name:** Salt Meadow

**Site ID:** R067BY035CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

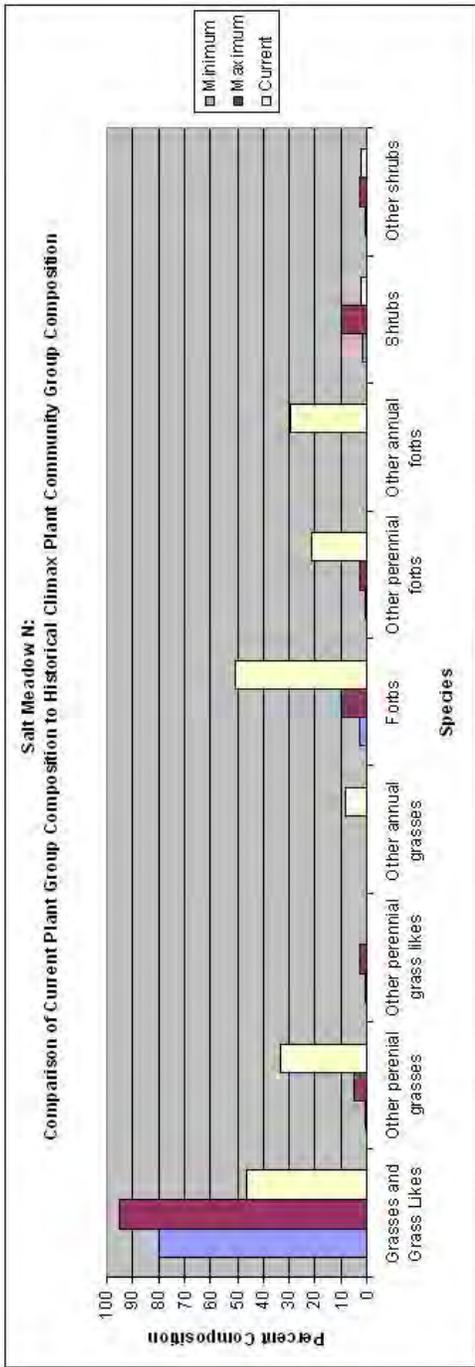
**n :** 100

**Date:** June 2005

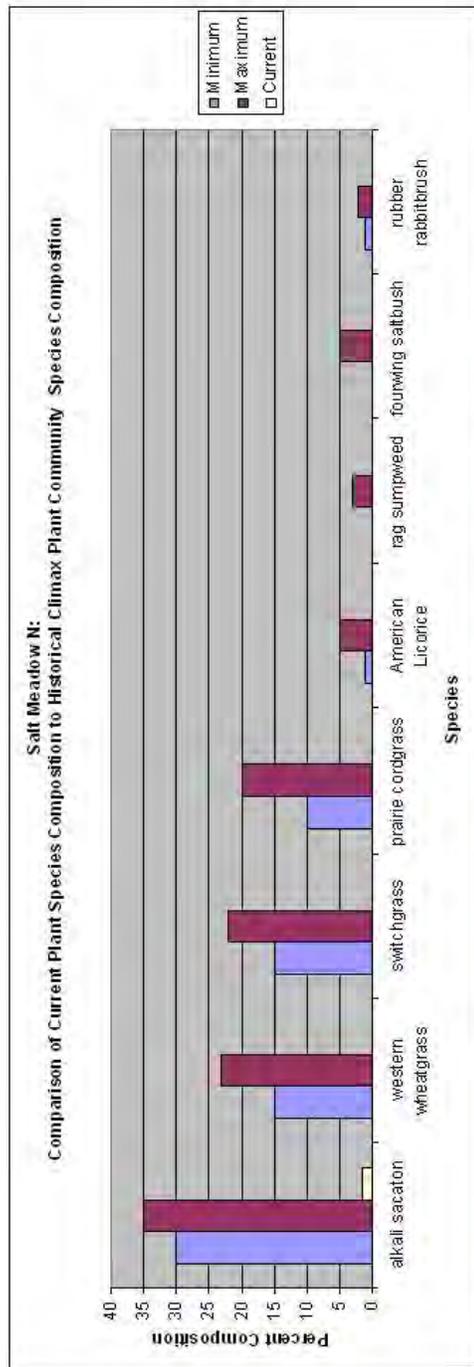
**Table 19: Salt Meadow N Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>		80-95	46.30	6.20
alkali sacaton	<i>Sporobolus airoides</i>	35-40	1.42	0.45
western wheatgrass	<i>Pascopyrum smithii</i>	15-25	0.00	0.00
switchgrass	<i>Panicum virgatum</i>	20-30	0.00	0.00
prairie cordgrass	<i>Spartina pectinata</i>	10-15	0.00	0.00
alkali bluegrass	<i>Poa secunda</i>	3-7	0.00	0.00
big bluestem	<i>Andropogon gerardii</i>	1-5	0.00	0.00
alkali cordgrass	<i>Spartina gracilis</i>	1-3	0.00	0.00
Canada wildrye	<i>Elymus canadensis</i>	1-3	0.00	0.00
little bluestem	<i>Schizachyrium scoparium</i>	0-3	0.00	0.00
yellow Indiangrass	<i>Sorghastrum nutans</i>	1-3	0.00	0.00
inland saltgrass	<i>Distichlis spicata</i>	1-3	3.78	0.68
slender wheatgrass	<i>Elymus trachycaulus</i>	0-3	0.00	0.00
Nuttalls alkaligrass	<i>Puccinellia nuttalliana</i>	1-2	0.00	0.00
vine mesquite	<i>Panicum obtusum</i>	2-5	0.00	0.00
green muhly	<i>Muhlenbergia racemosa</i>	0-1	0.00	0.00
foxtail barley	<i>Hordeum jubatum</i>	0-1	0.00	0.00
Baltic rush	<i>Juncus balticus</i>	1-3	0.00	0.00
Nebraska sedge	<i>Carex nebrascensis</i>	1-3	0.00	0.00
<b>Other perennial grass likes</b>		1-3	0.00	0.00
<b>Other perennial grasses</b>		1-3	32.91	2.99
blue grama	<i>Bouteloua gracilis</i>		15.75	0.00
bottlebrush squirreltail	<i>Elymus elymoides</i>		2.20	0.55
buffalograss	<i>Buchloe dactyloides</i>		4.41	0.71
red threeawn	<i>Aristida purpurea</i>		3.94	0.69
sand dropseed	<i>Sporobolus cryptandrus</i>		6.14	0.77
tumblegrass	<i>Schedonnardus paniculatus</i>		0.47	0.27
<b>Other annual grasses</b>		0	8.19	2.08
little annual barley	<i>Hordeum pusillum</i>		2.68	0.59
Panicum sp.	<i>Panicum sp.</i>		0.94	0.38
sixweeks fescue	<i>Vulpia octoflora</i>		2.36	0.57
witchgrass	<i>Panicum capillare</i>		2.20	0.55
<b>Forbs</b>		3-10	51.02	11.11
American licorice	<i>Glycyrrhiza lepidota</i>	1-5	0.00	0.00
rag sumpweed	<i>Iva xanthifolia</i>	0-3	0.00	0.00

showy prairie gentian	<i>Eustoma exaltatum</i> ssp. <i>Russellianum</i>	0-2	0.00	0.00
false boneset	<i>Brickellia eupatorioides</i>	0-1	0.00	0.00
Fremont goldenweed	<i>Oenopsis foliosa</i> var. <i>foliosa</i>	0-1	0.00	0.00
Illinois bundleflower	<i>Desmanthus illinoensis</i>	1-2	0.00	0.00
<b>Other perennial forbs</b>		1-3	21.26	6.07
buffalo-gourd	<i>Cucurbita foetidissima</i>		0.16	0.16
bush morning glory	<i>Ipomoea leptophylla</i>		0.47	0.27
curlycup gumweed	<i>Grindelia squarrosa</i>		0.31	0.22
ironplant goldenweed	<i>Haplopappus spinulosus</i>		0.47	0.27
dotted gayfeather	<i>Liatris punctata</i>		0.63	0.31
Louisiana sagewort	<i>Artemisia ludoviciana</i>		0.16	0.16
narrowleaf fourclock	<i>Mirabilis linearis</i>		0.31	0.22
upright prairie coneflower	<i>Ratibida columnifera</i>		2.05	0.53
prostrate vervain	<i>Verbena bracteata</i>		0.31	0.22
scarlet gaura	<i>Gaura coccinea</i>		2.52	0.58
scarlet globemallow	<i>Sphaeralcea coccinea</i>		8.98	0.78
short-ray prairie coneflower	<i>Ratibida tagetes</i>		1.89	0.51
slimflower scurfpea	<i>Psoralidium tenuiflorum</i>		0.79	0.34
stiff flax	<i>Linum rigidum</i>		0.47	0.27
stickleaf mentzilia	<i>Mentzelia decapetala</i>		0.16	0.16
UF10	<i>Chenopodiaceae</i>		0.16	0.16
wallflower	<i>Erysimum asperum</i>		0.47	0.27
western ragweed	<i>Ambrosia psilostachya</i>		0.63	0.31
white prairie clover	<i>Dalea candida</i>		0.16	0.16
winecup	<i>Callirhoe involucrata</i>		0.16	0.16
<b>Other annual forbs</b>		1-3	29.76	5.04
beggars tick	<i>Cryptantha circumscissa</i>		0.31	0.22
Chenopodium sp. #1	<i>Chenopodium</i> sp.		0.63	0.31
Chenopodium watsonii	<i>Chenopodium watsonii</i>		0.47	0.27
common sunflower	<i>Helianthus annuus</i>		0.79	0.34
conyza	<i>Conyza canadensis</i>		4.72	0.73
fetid marigold	<i>Dyssodia papposa</i>		4.25	0.70
flatspine stickseed	<i>Lappula echinata</i> var. <i>occidentalis</i>		2.05	0.53
kochia	<i>Kochia scoparia</i>		3.78	0.68
pepperpod mustard	<i>Lepidium densiflorum</i>		0.31	0.22
Russian thistle	<i>Salsola iberica</i>		11.65	0.69
woolly Indianwheat	<i>Plantago patagonica</i>		0.79	0.34
<b>Shrubs</b>		2-10	2.68	0.59
fourwing saltbush	<i>Atriplex canescens</i>	0-5	0.00	0.00
rubber rabbitbrush	<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i>	1-2	0.00	0.00
<b>Other shrubs</b>		1-3	2.68	0.59
sand sagebrush	<i>Artemisia filifolia</i>		2.68	0.59
<b>Ground Cover</b>				
Type	<b>% Cover</b>			
Plant	40.00			
Litter	45.17			
Bare	12.83			
Rock	0.00			
n	600			



**Figure 52: Salt Meadow N Plant Group Composition** - This graph depicts the current plant group composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that plant group on the Ecological Site. The yellow is the current group composition.



**Figure 53: Salt Meadow N Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

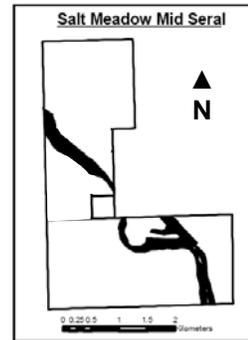
### Salt Meadow N



**Figure 54: Photographs of Salt Meadow N** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Salt Meadow Mid Seral

This area has transitioned to an **Increased Inland Saltgrass; Reduced Mid and Tall, Cool and Warm Season Grasses Plant Community**, a state usually reached through continuous grazing. All dominant grasses of the HCPC, alkali sacaton, western wheatgrass, switchgrass, and prairie cordgrass, were detected but at reduced levels of 11.43% ( $\pm$  0.53), 10.19% ( $\pm$  0.55), 4.89% ( $\pm$  0.50) and 0.34% ( $\pm$  0.15), respectively. The current dominant grass species were detected at 11.98% ( $\pm$  0.52) inland saltgrass, 11.43% ( $\pm$  0.53) alkali sacaton, 10.19% ( $\pm$  0.55) western wheatgrass, and 7.23% ( $\pm$  0.55) Canada wildrye. The dominant forb of the HCPC, American licorice, was detected at 0.47% ( $\pm$  0.17). The current dominant forb species were detected at a relative abundance of 5.23% ( $\pm$  0.51) short-ray prairie coneflower, 5.10% ( $\pm$  0.50) poison milkweed, 4.89% ( $\pm$  0.50) western ragweed, and 2.27% ( $\pm$  0.37) Louisiana sagewort. The dominant shrubs of the HCPC, fourwing saltbush and rubber rabbitbrush, were not detected. Sand sagebrush and willow were the current dominant shrubs at 0.34% ( $\pm$  0.15) and 0.21% ( $\pm$  0.12), respectively.



The Increased Inland Saltgrass; Reduced Mid and Tall, Cool and Warm Season Grasses Plant Community is at risk of losing many tallgrass species and has lost important forbs and shrubs. This community has reduced production and is very resistant to change. Resistance to change is depends on invasion of inland saltgrass; Salt Meadow Mid Seral currently supports slightly more saltgrass as than the HCPC. Russian thistle was found at high levels in this stratum. Although many of the dominant species of the HCPC are not found within the Salt Meadow Mid Seral stratum, most of the species are found within the SCMNHs. Species not found on the SCMNHs include: alkali bluegrass, big bluestem, alkali cordgrass, and Nuttalls alkaligrass. However, these species may be present on neighboring lands.

## Salt Meadow Mid Seral

**Site Type:** Rangeland

**Site Name:** Salt Meadow

**Site ID:** R067BY035CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 260

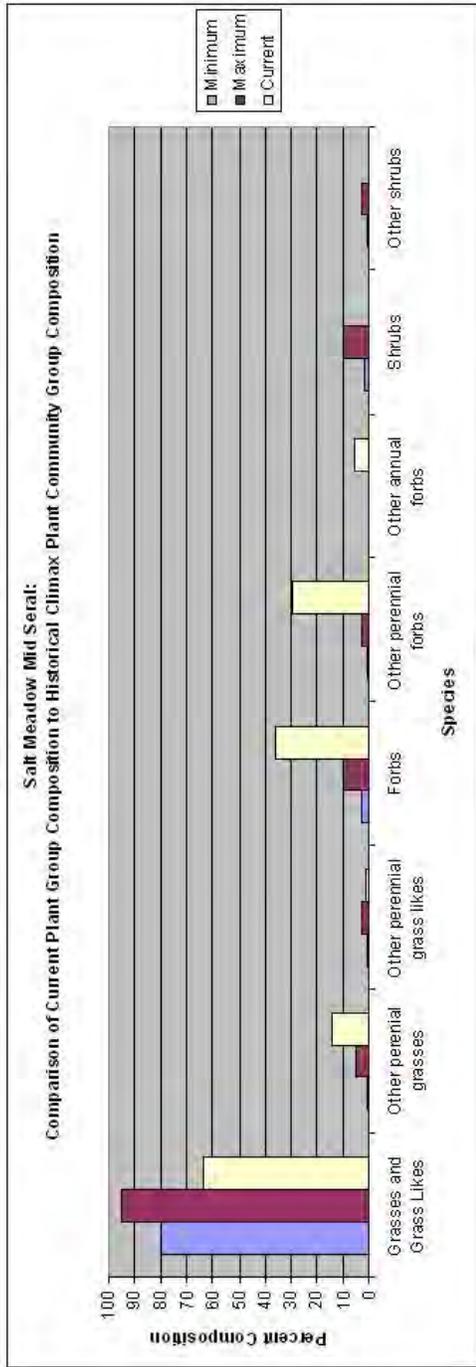
**Date:** June 2005

**Table 20: Salt Meadow -Mid Seral Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

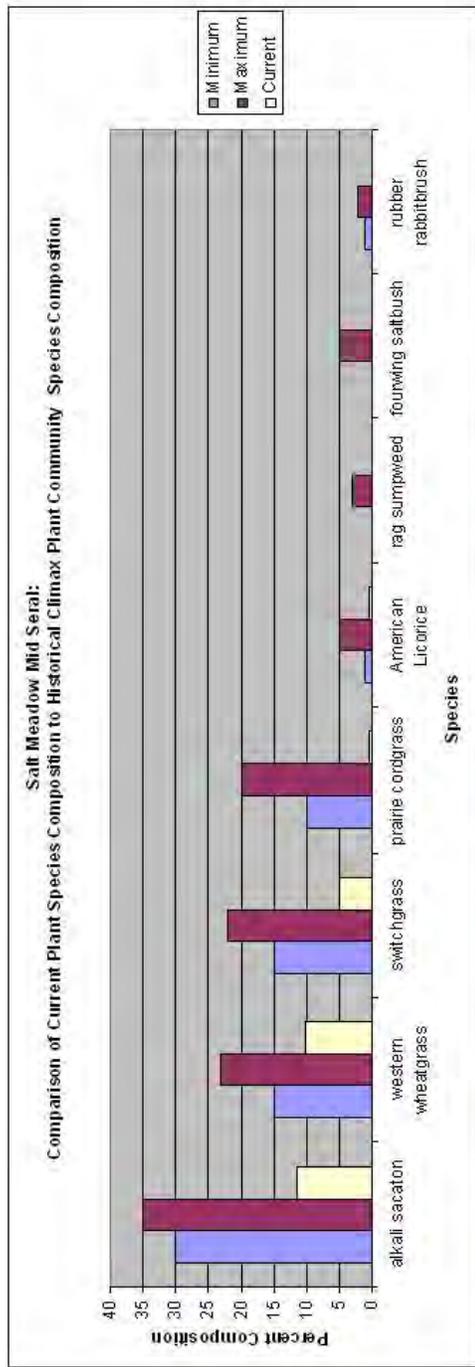
Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>		80-95	63.64	6.26
alkali sacaton	<i>Sporobolus airoides</i>	30-35	11.43	0.53
western wheatgrass	<i>Pascopyrum smithii</i>	15-23	10.19	0.55
switchgrass	<i>Panicum virgatum</i>	15-22	4.89	0.50
prairie cordgrass	<i>Spartina pectinata</i>	10-20	0.34	0.15
alkali bluegrass	<i>Poa secunda</i>	3-10	0.00	0.00
big bluestem	<i>Andropogon gerardii</i>	2-7	0.00	0.00
alkali cordgrass	<i>Spartina gracilis</i>	1-5	0.00	0.00
Canada wildrye	<i>Elymus canadensis</i>	1-5	7.23	0.55
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.00	0.00
yellow Indiangrass	<i>Sorghastrum nutans</i>	0-5	0.00	0.00
inland saltgrass	<i>Distichlis spicata</i>	1-3	11.98	0.52
slender wheatgrass	<i>Elymus trachycaulus</i>	1-3	0.14	0.10
Nuttalls alkaligrass	<i>Puccinellia nuttalliana</i>	1-2	0.00	0.00
vine mesquite	<i>Panicum obtusum</i>	0-2	0.83	0.23
green muhly	<i>Muhlenbergia racemosa</i>	0-1	0.00	0.00
foxtail barley	<i>Hordeum jubatum</i>	0-1	0.41	0.17
Baltic rush	<i>Juncus balticus</i>	1-3	0.34	0.15
Nebraska sedge	<i>Carex nebrascensis</i>	1-3	0.00	0.00
<b>Other perennial grasses</b>		1-5	14.46	2.38
blue grama	<i>Bouteloua gracilis</i>		3.24	0.43
buffalograss	<i>Buchloe dactyloides</i>		5.79	0.52
Kentucky bluegrass	<i>Poa pratensis</i>		0.48	0.18
red threeawn	<i>Aristida purpurea</i>		0.62	0.20
sand dropseed	<i>Sporobolus cryptandrus</i>		2.34	0.38
scratchgrass	<i>Muhlenbergia asperifolia</i>		0.14	0.10
sideoats grama	<i>Bouteloua curtipendula</i>		0.76	0.22
tumblegrass	<i>Schedonnardus paniculatus</i>		0.14	0.10
UG1			0.96	0.25
<b>Other perennial grass likes</b>		1-3	1.38	0.43
bullrush	<i>Scirpus americanus</i>		0.69	0.21
silvertop sedge	<i>Carex foenea</i>		0.69	0.21
<b>Forbs</b>		3-10	35.81	7.50
American licorice	<i>Glycyrrhiza lepidota</i>	1-5	0.41	0.17
rag sumpweed	<i>Iva xanthifolia</i>	0-3	0.00	0.00

showy prairie gentian	<i>Eustoma exaltatum ssp. Russellianum</i>	0-2	0.00	0.00
false boneset	<i>Brickellia eupatorioides</i>	0-1	0.00	0.00
Fremont goldenweed	<i>Oenopsis foliosa var. foliosa</i>	0-1	0.00	0.00
Illinois bundleflower	<i>Desmanthus illinoensis</i>	0-1	0.00	0.00
<b>Other perennial forbs</b>		1-5	29.68	5.39
common groundcherry	<i>Physalis longifolia</i>		1.10	0.27
curlycup gumweed	<i>Grindelia squarrosa</i>		0.28	0.14
ironplant goldenweed	<i>Haplopappus spinulosus</i>		0.07	0.07
frog fruit	<i>Lippia cuneifolia</i>		0.14	0.10
hairy fourclock	<i>Mirabilis hirsuta</i>		0.90	0.24
hairy goldenaster	<i>Heterotheca villosa</i>		0.07	0.07
heath aster	<i>Symphotrichum ericoides</i>		0.55	0.19
horsetail	<i>Equisetum hyemale</i>		0.55	0.19
Indianhemp dogbane	<i>Apocynum cannabinum</i>		0.90	0.24
late goldenrod	<i>Solidago gigantea</i>		0.21	0.12
Louisiana sagewort	<i>Artemisia ludoviciana</i>		2.27	0.37
poison milkweed	<i>Asclepias subverticillata</i>		5.10	0.50
rush skeletonplant	<i>Lygodesmia juncea</i>		0.07	0.07
scarlet gaura	<i>Gaura coccinea</i>		2.00	0.35
scarlet globemallow	<i>Sphaeralcea coccinea</i>		1.45	0.30
short-ray prairie coneflower	<i>Ratibida tagetes</i>		5.23	0.51
stinking milkvetch	<i>Astragalus praelongus var. ellisiae</i>		0.07	0.07
UF10	<i>Chenopodiaceae</i>		0.41	0.17
UF12	<i>Fabaceae</i>		0.07	0.07
UF8	<i>Oxytropis sp.</i>		0.62	0.20
wavyleaf thistle	<i>Cirsium undulatum</i>		0.55	0.19
western ragweed	<i>Ambrosia psilostachya</i>		4.89	0.50
white sweetclover	<i>Melilotus alba</i>		0.21	0.12
winecup	<i>Callirhoe involucrata</i>		2.00	0.35
<b>Other annual forbs</b>		0	5.72	1.94
Chenopodium watsonii	<i>Chenopodium watsonii</i>		0.48	0.18
common sunflower	<i>Helianthus annuus</i>		0.28	0.14
conyza	<i>Conyza canadensis</i>		1.31	0.29
kochia	<i>Kochia scoparia</i>		0.69	0.21
pepperpod mustard	<i>Lepidium densiflorum</i>		0.41	0.17
prickly lettuce	<i>Lactuca serriola</i>		0.07	0.07
prostrate vervain	<i>Verbena bracteata</i>		0.07	0.07
Russian thistle	<i>Salsola iberica</i>		0.48	0.18
salsify	<i>Tragopogon dubius</i>		0.21	0.12
thyme-leaved spurge	<i>Chamaesyce serpyllifolia ssp. serpyllifolia</i>		0.41	0.17
velvet gaura	<i>Gaura parviflora</i>		1.24	0.28
woolly Indianwheat	<i>Plantago patagonica</i>		0.07	0.07
<b>Shrubs</b>		2-10	0.55	0.27
fourwing saltbush	<i>Atriplex canescens</i>	0-5	0.00	0.00
rubber rabbitbrush	<i>Ericameria nauseosa ssp. nauseosa</i>	1-2	0.00	0.00
<b>Other shrubs</b>		1-3	0.55	0.27
sand sagebrush	<i>Artemisia filifolia</i>		0.34	0.15
willow	<i>Salix sp.</i>		0.21	0.12

<b>Ground Cover</b>	
Type	% Cover
Plant	35.58
Litter	62.08
Bare	2.17
Rock	0.00
n	600



**Figure 56: Salt Meadow Mid Seral Plant Group Composition** - This graph depicts the current plant group composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that plant group on the Ecological Site. The yellow is the current group composition.



**Figure 55: Salt Meadow Mid Seral Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

**Salt Meadow Mid Seral**



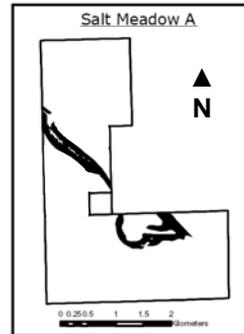
**Figure 57: Photographs of Salt Meadow Mid Seral** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Salt Meadow A

The Salt Meadow A stratum is located throughout the property. Salt Meadow A is north of Sand Creek and occupies NPS land on sections 13, 24, & 25 T17S R46W and section 30 T17S R45W.

This area has transitioned to an **Increased Inland Saltgrass; Reduced Mid and Tall, Cool and Warm Season Grasses Plant Community**, a state usually reached through continuous grazing. Two dominant grasses, alkali sacaton and western wheatgrass, were detected but at reduced levels of the HCPC at 16.28% ( $\pm 0.69$ ) and 10.15% ( $\pm 0.96$ ), respectively. The other dominant grasses, switchgrass and prairie cordgrass, were not detected. The current dominant grass species were detected at 17.43% ( $\pm 0.55$ ) inland saltgrass, 16.28% ( $\pm 0.69$ ) alkali sacaton, 10.15% ( $\pm 0.96$ ) western wheatgrass, 7.85% ( $\pm 0.95$ ) buffalograss, and 7.47% ( $\pm 0.94$ ) blue grama. The dominant forb of the HCPC, American licorice, was detected at 0.57% ( $\pm 0.33$ ). The current dominant forb species were detected at a relative abundance of 5.56% ( $\pm 0.78$ ) short-ray prairie coneflower, 4.41% ( $\pm 0.81$ ) poison milkweed, 4.02% ( $\pm 0.78$ ) Louisiana sagewort, and 2.87% ( $\pm 0.69$ ) scarlet globemallow. The dominant shrubs of the HCPC, fourwing saltbush and rubber rabbitbrush, were not detected. Sand sagebrush was the dominant shrub at 0.96% ( $\pm 0.42$ ).

The Increased Inland Saltgrass; Reduced Mid and Tall, Cool and Warm Season Grasses Plant Community is at risk of losing tallgrass species and has lost important forbs and shrubs. This community has reduced production and is very resistant to change. Resistance to change is depends on invasion of inland saltgrass; Salt Meadow A currently supports five times the amount of saltgrass as the HCPC. Large swaths of poison milkweed are present in the stratum. Although many of the dominant species of the HCPC are not found within the Salt Meadow A stratum, most of the species are found within the SCMNHS. Species not found on the SCMNHS include: alkali bluegrass, big bluestem, alkali cordgrass, and Nuttalls alkaligrass. However, these species may be present on neighboring lands.



## Salt Meadow A

**Site Type:** Rangeland

**Site Name:** Salt Meadow

**Site ID:** R067BY035CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 100

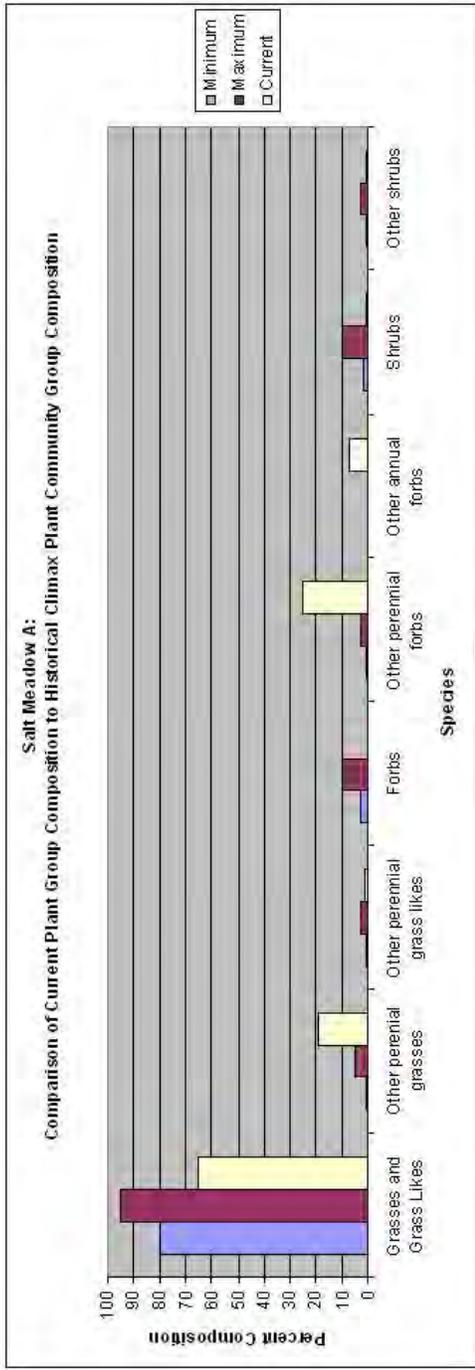
**Date:** July 2005

**Table 21: Salt Meadow A Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

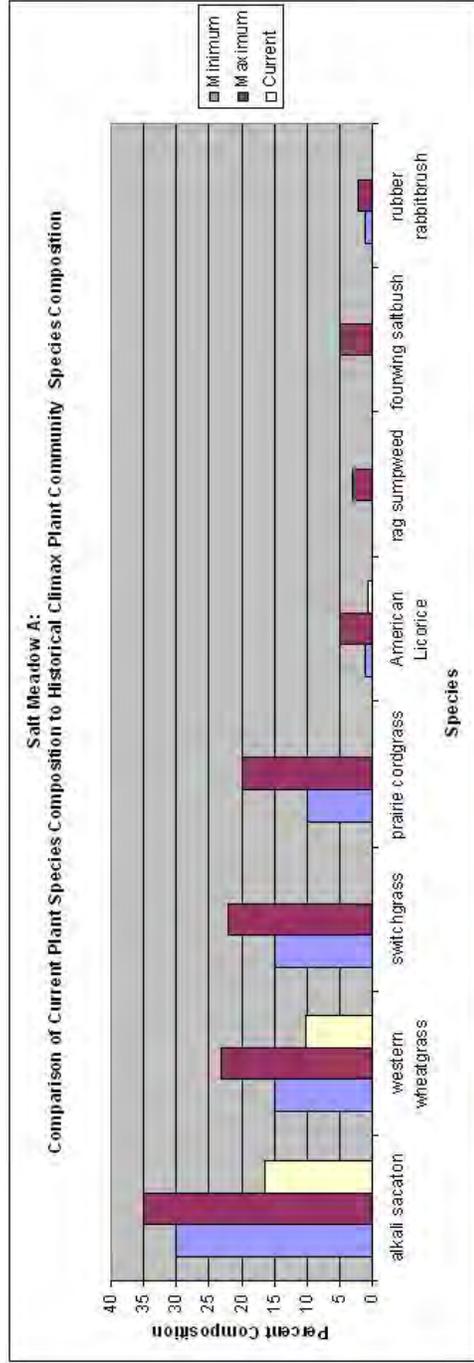
Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>		80-95	65.52	6.64
alkali sacaton	<i>Sporobolus airoides</i>	30-35	16.28	0.69
western wheatgrass	<i>Pascopyrum smithii</i>	15-23	10.15	0.96
switchgrass	<i>Panicum virgatum</i>	15-22	0.00	0.00
prairie cordgrass	<i>Spartina pectinata</i>	10-20	0.00	0.00
alkali bluegrass	<i>Poa secunda</i>	3-10	0.00	0.00
big bluestem	<i>Andropogon gerardii</i>	2-7	0.00	0.00
alkali cordgrass	<i>Spartina gracilis</i>	1-5	0.00	0.00
Canada wildrye	<i>Elymus canadensis</i>	1-5	0.00	0.00
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.00	0.00
yellow Indiangrass	<i>Sorghastrum nutans</i>	0-5	0.00	0.00
inland saltgrass	<i>Distichlis spicata</i>	1-3	17.43	0.55
slender wheatgrass	<i>Elymus trachycaulus</i>	1-3	0.00	0.00
Nuttalls alkaligrass	<i>Puccinellia nuttalliana</i>	1-2	0.00	0.00
vine mesquite	<i>Panicum obtusum</i>	0-2	0.38	0.27
green muhly	<i>Muhlenbergia racemosa</i>	0-1	0.00	0.00
foxtail barley	<i>Hordeum jubatum</i>	0-1	0.00	0.00
Baltic rush	<i>Juncus balticus</i>	1-3	0.57	0.33
Nebraska sedge	<i>Carex nebrascensis</i>	1-3	0.00	0.00
<b>Other perennial grass likes</b>		1-3	1.53	0.73
bullrush	<i>Scirpus americanus</i>		0.38	0.27
silvertop sedge	<i>Carex foenea</i>		1.15	0.46
<b>Other perennial grasses</b>		1-5	19.16	3.11
blue grama	<i>Bouteloua gracilis</i>		7.47	0.94
buffalograss	<i>Buchloe dactyloides</i>		7.85	0.95
red threeawn	<i>Aristida purpurea</i>		0.57	0.33
sand dropseed	<i>Sporobolus cryptandrus</i>		3.07	0.71
sideoats grama	<i>Bouteloua curtipendula</i>		0.19	0.19
<b>Forbs</b>		3-10	33.52	2.52
American licorice	<i>Glycyrrhiza lepidota</i>	1-5	0.57	0.33
rag sumpweed	<i>Iva xanthifolia</i>	0-3	0.00	0.00
showy prairie gentian	<i>Eustoma exaltatum</i> ssp. <i>Russellianum</i>	0-2	0.00	0.00
false boneset	<i>Brickellia eupatorioides</i>	0-1	0.00	0.00
Fremont goldenweed	<i>Oenopsis foliosa</i> var. <i>foliosa</i>	0-1	0.00	0.00

Illinois bundleflower	<i>Desmanthus illinoensis</i>	0-1	0.00	0.00
<b>Other perennial forbs</b>		1-5	25.48	1.67
common groundcherry	<i>Physalis longifolia</i>		1.53	0.52
curlycup gumweed	<i>Grindelia squarrosa</i>		0.19	0.19
frog fruit	<i>Lippia cuneifolia</i>		0.38	0.27
hairy fouroclock	<i>Mirabilis hirsuta</i>		2.11	0.60
Louisiana sagewort	<i>Artemisia ludoviciana</i>		4.02	0.78
poison milkweed	<i>Asclepias subverticillata</i>		4.41	0.81
rush skeletonplant	<i>Lygodesmia juncea</i>		0.19	0.19
scarlet gaura	<i>Gaura coccinea</i>		2.49	0.65
scarlet globemallow	<i>Sphaeralcea coccinea</i>		2.87	0.69
short-ray prairie coneflower	<i>Ratibida tagetes</i>		5.56	0.87
western ragweed	<i>Ambrosia psilostachya</i>		1.34	0.49
winecup	<i>Callirhoe involucrata</i>		0.38	0.27
<b>Other annual forbs</b>		0	7.47	1.26
Chenopodium watsonii	<i>Chenopodium watsonii</i>		1.34	0.49
conyza	<i>Conyza canadensis</i>		1.34	0.49
kochia	<i>Kochia scoparia</i>		1.34	0.49
pepperpod mustard	<i>Lepidium densiflorum</i>		0.77	0.38
Russian thistle	<i>Salsola iberica</i>		0.96	0.42
thyme-leaved spurge	<i>Chamaesyce serpyllifolia ssp. serpyllifolia</i>		0.19	0.19
velvet gaura	<i>Gaura parviflora</i>		1.34	0.49
western fleabane	<i>Erigeron bellidiastrum</i>		0.00	0.00
woolly Indianwheat	<i>Plantago patagonica</i>		0.19	0.19
<b>Shrubs</b>		2-10	0.96	0.42
fourwing saltbush	<i>Atriplex canescens</i>	0-5	0.00	0.00
rubber rabbitbrush	<i>Ericameria nauseosa ssp. nauseosa</i>	1-2	0.00	0.00
<b>Other shrubs</b>		1-3	0.96	0.42
sand sagebrush	<i>Artemisia filifolia</i>		0.96	0.42

<b>Ground Cover</b>	
Type	% Cover
Plant	38.33
Litter	58.83
Bare	2.50
Rock	0.00
n	600

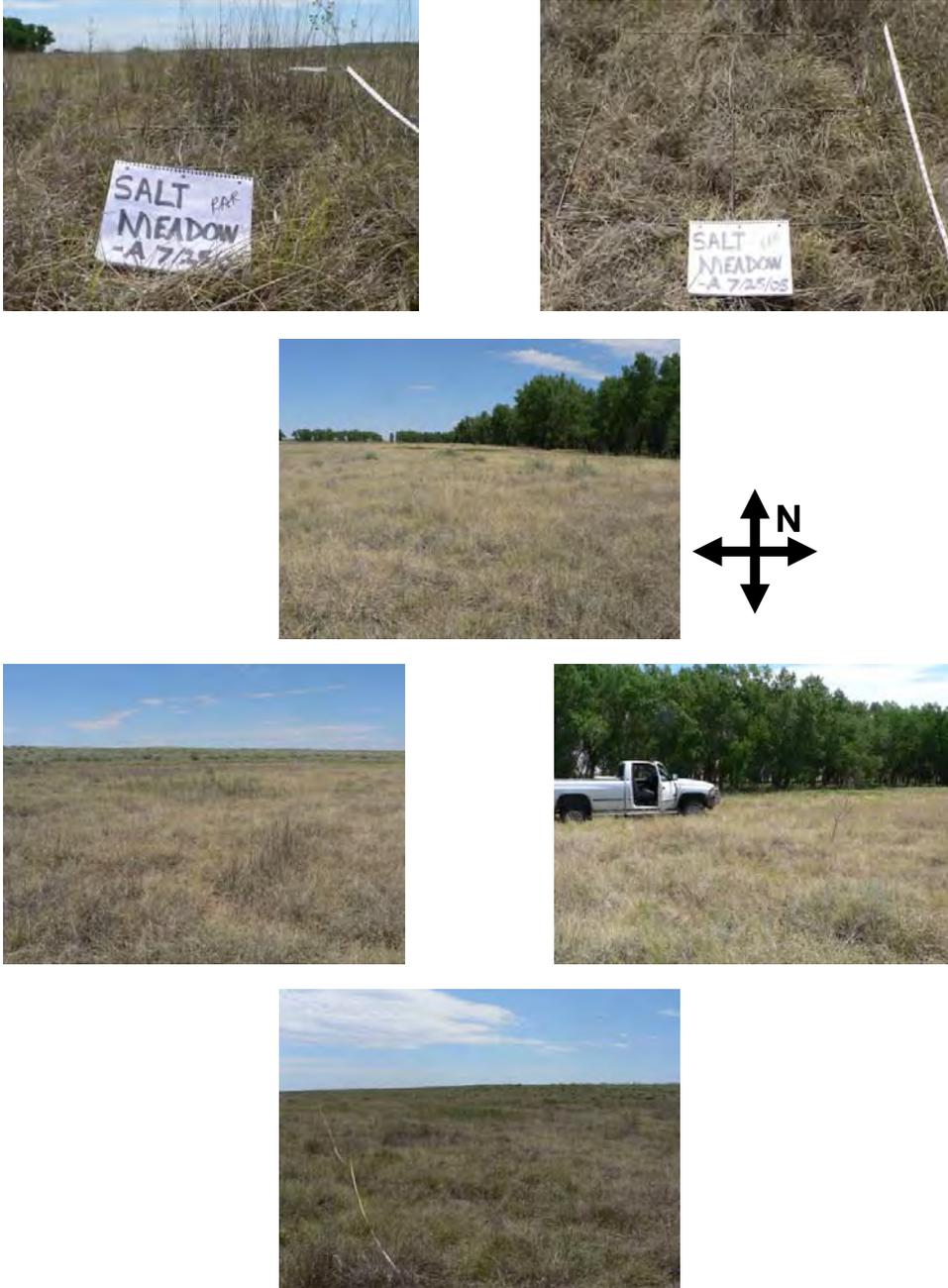


**Figure 59: Salt Meadow A Plant Group Composition** - This graph depicts the current plant group composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that plant group on the Ecological Site. The yellow is the current group composition.



**Figure 58: Salt Meadow A Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

### Salt Meadow A



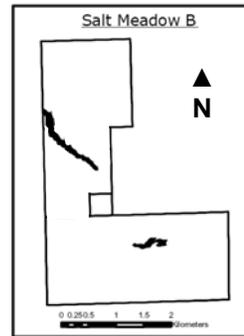
**Figure 60: Photographs of Salt Meadow A** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Salt Meadow B

The Salt Meadow B stratum is located throughout the property. Salt Meadow A is north of Sand Creek and occupies NPS land on sections 13, 24, & 25 T17S R46W and section 30 T17S R45W. A grove of cottonwood trees occupy the stratum.

This area has transitioned to an **Increased Inland Saltgrass; Reduced Mid and Tall, Cool and Warm Season Grasses Plant Community**, a state usually reached through continuous grazing. All four dominant grasses from the HCPC were detected, most at reduced levels. They were detected at a relative abundance of 6.61% ( $\pm 1.04$ ) alkali sacaton, 15.95% ( $\pm 1.05$ ) western wheatgrass, 3.87% ( $\pm 0.86$ ) switchgrass, and 0.46% ( $\pm 0.32$ ) prairie cordgrass. The current dominant grass species were detected at 15.95% ( $\pm 1.05$ ) western wheatgrass, 15.49% ( $\pm 1.07$ ) Canada wildrye, 7.06% ( $\pm 1.06$ ) inland saltgrass, 6.61% ( $\pm 1.04$ ) alkali sacaton, and 5.92% ( $\pm 1.00$ ) buffalograss. The dominant forb of the HCPC, American licorice, was detected at 0.46% ( $\pm 0.32$ ). The current dominant forb species were detected at a relative abundance of 9.79% ( $\pm 1.13$ ) western ragweed, 7.29% ( $\pm 1.07$ ) poison milkweed, and 4.10% ( $\pm 0.88$ ) short-ray coneflower. No shrubs were detected.

The Increased Inland Saltgrass; Reduced Mid and Tall, Cool and Warm Season Grasses Plant Community is at risk of losing many tallgrass species and has lost important forbs and shrubs. This community has reduced production and is very resistant to change. Resistance to change is depends on invasion of inland saltgrass; Salt Meadow B currently supports twice the amount of saltgrass as the HCPC. Large swaths of poison milkweed are present in the stratum. Although many of the dominant species of the HCPC are not found within the Salt Meadow B stratum, most of the species are found within the SCMNHs. Species not found on the SCMNHs include: alkali bluegrass, big bluestem, alkali cordgrass, and Nuttalls alkaligrass. However, these species may be present on neighboring lands.



## Salt Meadow B

**Site Type:** Rangeland

**Site Name:** Salt Meadow

**Site ID:** R067BY035CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 100

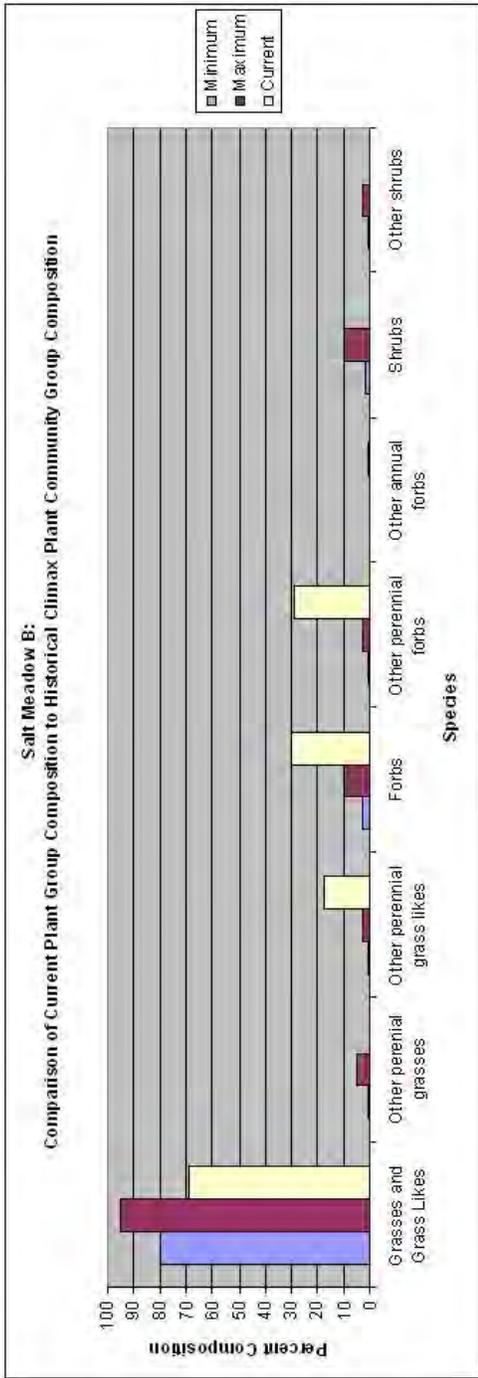
**Date:** July 2005

**Table 22: Salt Meadow B Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

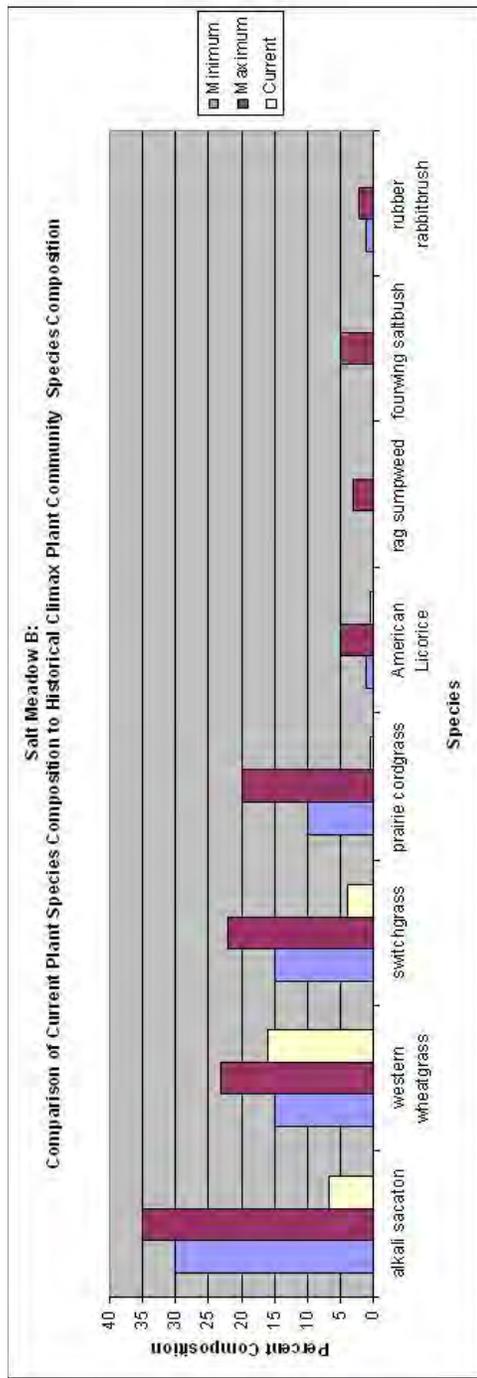
Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>		80-95	68.79	11.05
alkali sacaton	<i>Sporobolus airoides</i>	30-35	6.61	1.04
western wheatgrass	<i>Pascopyrum smithii</i>	15-23	15.95	1.05
switchgrass	<i>Panicum virgatum</i>	15-22	3.87	0.86
prairie cordgrass	<i>Spartina pectinata</i>	10-20	0.46	0.32
alkali bluegrass	<i>Poa secunda</i>	3-10	0.00	0.00
big bluestem	<i>Andropogon gerardii</i>	2-7	0.00	0.00
alkali cordgrass	<i>Spartina gracilis</i>	1-5	0.00	0.00
Canada wildrye	<i>Elymus canadensis</i>	1-5	15.49	1.07
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.00	0.00
yellow Indiangrass	<i>Sorghastrum nutans</i>	0-5	0.00	0.00
inland saltgrass	<i>Distichlis spicata</i>	1-3	7.06	1.06
slender wheatgrass	<i>Elymus trachycaulus</i>	1-3	0.46	0.32
Nuttalls alkaligrass	<i>Puccinellia nuttalliana</i>	1-2	0.00	0.00
vine mesquite	<i>Panicum obtusum</i>	0-2	0.00	0.00
green muhly	<i>Muhlenbergia racemosa</i>	0-1	0.00	0.00
foxtail barley	<i>Hordeum jubatum</i>	0-1	0.68	0.39
Baltic rush	<i>Juncus balticus</i>	1-3	0.00	0.00
Nebraska sedge	<i>Carex nebrascensis</i>	1-3	0.00	0.00
<b>Other perennial grass likes</b>		1-5	0.68	0.39
silvertop sedge	<i>Carex foenea</i>		0.68	0.39
<b>Other perennial grasses</b>		1-3	17.54	4.55
blue grama	<i>Bouteloua gracilis</i>		1.82	0.62
buffalograss	<i>Buchloe dactyloides</i>		5.92	1.00
Kentucky bluegrass	<i>Poa pratensis</i>		0.68	0.39
red threeawn	<i>Aristida purpurea</i>		1.37	0.54
sand dropseed	<i>Sporobolus cryptandrus</i>		4.10	0.88
tumblegrass	<i>Schedonnardus paniculatus</i>		0.46	0.32
UG1			3.19	0.79
<b>Forbs</b>		3-10	30.30	8.14
American licorice	<i>Glycyrrhiza lepidota</i>	1-5	0.46	0.32
rag sumpweed	<i>Iva xanthifolia</i>	0-3	0.00	0.00
showy prairie gentian	<i>Eustoma exaltatum ssp. Russellianum</i>	0-2	0.00	0.00
false boneset	<i>Brickellia eupatorioides</i>	0-1	0.00	0.00
Fremont goldenweed	<i>Oenopsis foliosa var. foliosa</i>	0-1	0.00	0.00

Illinois bundleflower	<i>Desmanthus illinoensis</i>	0-1	0.00	0.00
<b>Other perennial forbs</b>		1-5	28.93	7.04
common groundcherry	<i>Physalis longifolia</i>		0.91	0.45
curlycup gumweed	<i>Grindelia squarrosa</i>		0.68	0.39
hairy fourclock	<i>Mirabilis hirsuta</i>		0.46	0.32
horsetail	<i>Equisetum hyemale</i>		0.68	0.39
Indianhemp dogbane	<i>Apocynum cannabinum</i>		0.68	0.39
Louisiana sagewort	<i>Artemisia ludoviciana</i>		1.14	0.50
poison milkweed	<i>Asclepias subverticillata</i>		7.29	1.07
scarlet gaura	<i>Gaura coccinea</i>		0.46	0.32
scarlet globemallow	<i>Sphaeralcea coccinea</i>		0.23	0.23
short-ray prairie coneflower	<i>Ratibida tagetes</i>		4.10	0.88
UF10	<i>Chenopodiaceae</i>		0.46	0.32
UF8	<i>Oxytropis sp.</i>		2.05	0.66
western ragweed	<i>Ambrosia psilostachya</i>		9.79	1.13
<b>Other annual forbs</b>		0	0.91	0.78
common sunflower	<i>Helianthus annuus</i>		0.23	0.23
salsify	<i>Tragopogon dubius</i>		0.46	0.32
velvet gaura	<i>Gaura parviflora</i>		0.23	0.23
<b>Shrubs</b>		2-10	0.00	0.00
fourwing saltbush	<i>Atriplex canescens</i>	0-5	0.00	0.00
rubber rabbitbrush	<i>Ericameria nauseosa ssp. nauseosa</i>	1-2	0.00	0.00
<b>Other shrubs</b>		1-3	0.00	0.00

Ground Cover	
Type	% Cover
Plant	16.67
Litter	80.83
Bare	2.50
Rock	0.00
n	600



**Figure 62: Salt Meadow B Plant Group Composition** - This graph depicts the current plant group composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that plant group on the Ecological Site. The yellow is the current group composition.



**Figure 61: Salt Meadow B Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

### Salt Meadow B



**Figure 63: Photographs of Salt Meadow B** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

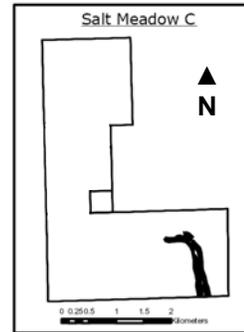
## Salt Meadow C

The Salt Meadow C stratum is located on southeast portion of the property. Salt Meadow C runs along Sand Creek and occupies NPS land on section 30 T17S R45W.

This area has transitioned to an **Increased Inland Saltgrass; Reduced Mid and Tall, Cool and Warm Season Grasses Plant Community**, a state usually reached through continuous grazing. All four dominant grasses from the HCPC were detected, most at reduced levels. They were detected at a relative abundance of 10.55% ( $\pm 0.54$ )

alkali sacaton, 5.07% ( $\pm 0.78$ ) western wheatgrass, 10.95% ( $\pm 0.48$ ) switchgrass, and 0.61% ( $\pm 0.35$ ) prairie cordgrass. The current dominant grass species were detected at 10.95% ( $\pm 0.48$ ) switchgrass, 10.55% ( $\pm 0.54$ ) alkali sacaton, 10.55% ( $\pm 0.54$ ) inland saltgrass, 7.51% ( $\pm 0.77$ ) Canada wildrye, and 5.07% ( $\pm 0.78$ ) western wheatgrass. The dominant forb of the HCPC, American licorice, was detected at 0.20% ( $\pm 0.20$ ). The current dominant forb species were detected at a relative abundance of 5.48% ( $\pm 0.79$ ) winecup, 4.26% ( $\pm 0.76$ ) western ragweed, 3.85% ( $\pm 0.74$ ) poison milkweed, and 3.65% ( $\pm 0.73$ ) upright prairie coneflower. The dominant shrubs of the HCPC, fourwing saltbush and rubber rabbitbrush, were not detected. Willow was the dominant shrub at 0.61% ( $\pm 0.35$ ).

The Increased Inland Saltgrass; Reduced Mid and Tall, Cool and Warm Season Grasses Plant Community is at risk of losing many tallgrass species and has lost important forbs and shrubs. This community has reduced production and is very resistant to change. Resistance to change is depends on invasion of inland saltgrass; Salt Meadow C currently supports three times the amount of saltgrass as the HCPC. Large swaths of poison milkweed are present in the stratum. Although many of the dominant species of the HCPC are not found within the Salt Meadow B stratum, most of the species are found within the SCMNHs. Species not found on the SCMNHs include: alkali bluegrass, big bluestem, alkali cordgrass, and Nuttalls alkaligrass. However, these species may be present on neighboring lands.



## Salt Meadow C

**Site Type:** Rangeland

**Site Name:** Salt Meadow

**Site ID:** R067BY035CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 60

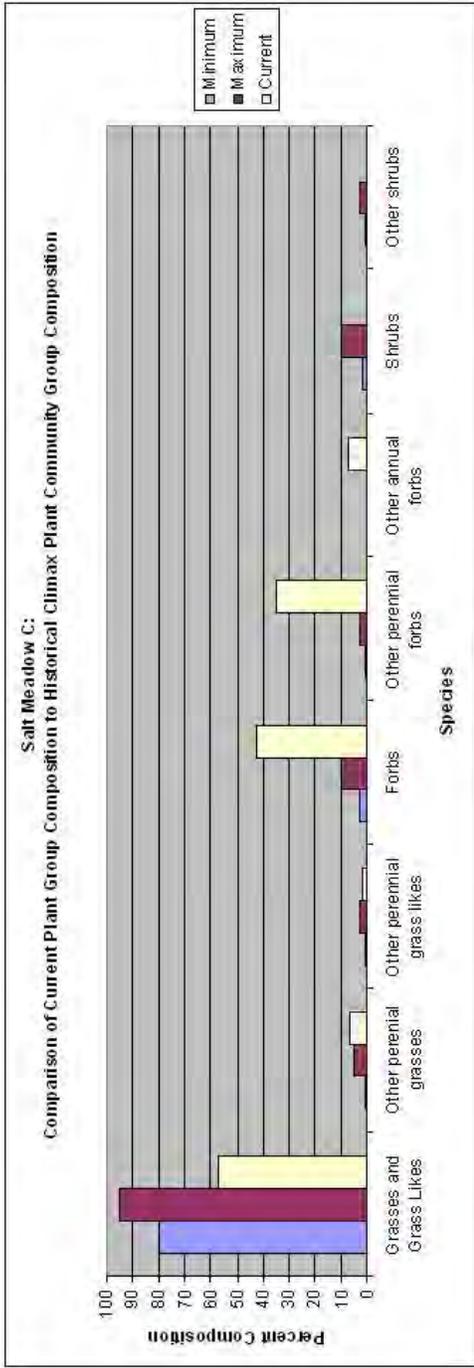
**Date:** July 2005

**Table 23: Salt Meadow C Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

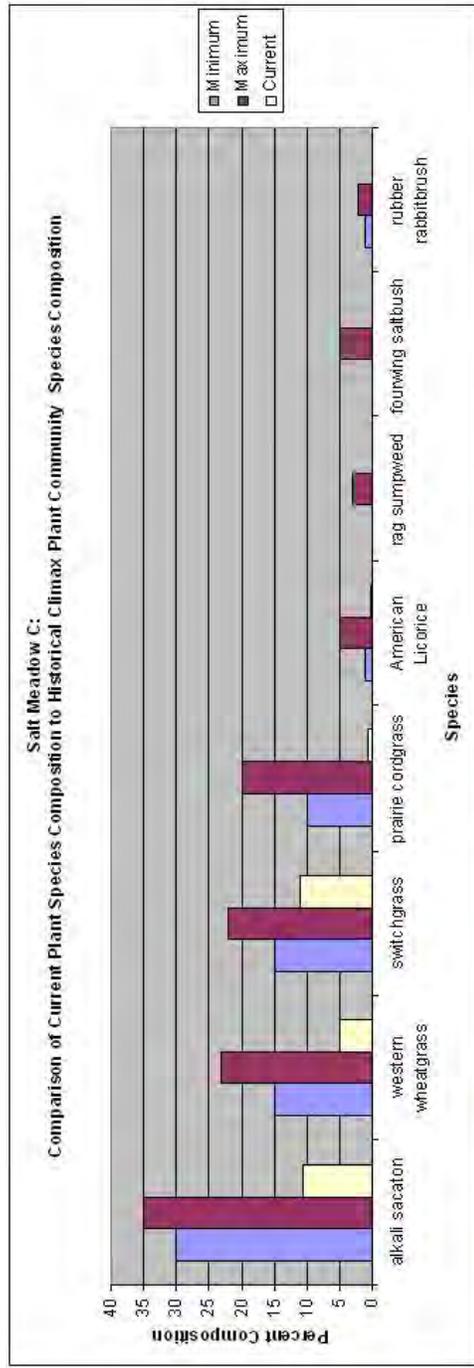
Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>		80-95	56.80	7.40
alkali sacaton	<i>Sporobolus airoides</i>	30-35	10.55	0.54
western wheatgrass	<i>Pascopyrum smithii</i>	15-23	5.07	0.78
switchgrass	<i>Panicum virgatum</i>	15-22	10.95	0.48
prairie cordgrass	<i>Spartina pectinata</i>	10-20	0.61	0.35
alkali bluegrass	<i>Poa secunda</i>	3-10	0.00	0.00
big bluestem	<i>Andropogon gerardii</i>	2-7	0.00	0.00
alkali cordgrass	<i>Spartina gracilis</i>	1-5	0.00	0.00
Canada wildrye	<i>Elymus canadensis</i>	1-5	7.51	0.77
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.00	0.00
yellow Indiangrass	<i>Sorghastrum nutans</i>	0-5	0.00	0.00
inland saltgrass	<i>Distichlis spicata</i>	1-3	10.55	0.54
slender wheatgrass	<i>Elymus trachycaulus</i>	1-3	0.00	0.00
Nuttalls alkaligrass	<i>Puccinellia nuttalliana</i>	1-2	0.00	0.00
vine mesquite	<i>Panicum obtusum</i>	0-2	2.03	0.59
green muhly	<i>Muhlenbergia racemosa</i>	0-1	0.00	0.00
foxtail barley	<i>Hordeum jubatum</i>	0-1	0.61	0.35
Baltic rush	<i>Juncus balticus</i>	1-3	0.41	0.28
Nebraska sedge	<i>Carex nebrascensis</i>	1-3	0.00	0.00
<b>Other perennial grass likes</b>		1-3	1.83	0.74
bullrush	<i>Scirpus americanus</i>		1.62	0.54
silvertop sedge	<i>Carex foenea</i>		0.20	0.20
<b>Other perennial grasses</b>		1-5	6.69	1.98
buffalograss	<i>Buchloe dactyloides</i>		3.45	0.71
Kentucky bluegrass	<i>Poa pratensis</i>		0.81	0.40
scratchgrass	<i>Muhlenbergia asperifolia</i>		0.41	0.28
sideoats grama	<i>Bouteloua curtipendula</i>		2.03	0.59
<b>Forbs</b>		3-10	42.60	13.03
American licorice	<i>Glycyrrhiza lepidota</i>	1-5	0.20	0.20
rag sumpweed	<i>Iva xanthifolia</i>	0-3	0.00	0.00
showy prairie gentian	<i>Eustoma exaltatum ssp. Russellianum</i>	0-2	0.00	0.00
false boneset	<i>Brickellia eupatorioides</i>	0-1	0.00	0.00
Fremont goldenweed	<i>Oenopsis foliosa var. foliosa</i>	0-1	0.00	0.00
Illinois bundleflower	<i>Desmanthus illinoensis</i>	0-1	0.00	0.00

<b>Other perennial forbs</b>		1-5	34.89	9.79
common groundcherry	<i>Physalis longifolia</i>		0.81	0.40
ironplant goldenweed	<i>Haplopappus spinulosus</i>		0.20	0.20
hairy goldenaster	<i>Heterotheca villosa</i>		0.20	0.20
heath aster	<i>Symphotrichum ericoides</i>		1.42	0.51
horsetail	<i>Equisetum hyemale</i>		1.01	0.44
Indianhemp dogbane	<i>Apocynum cannabinum</i>		2.03	0.59
Louisiana sagewort	<i>Artemisia ludoviciana</i>		1.42	0.51
pepperpod mustard	<i>Lepidium densiflorum</i>		0.41	0.28
poison milkweed	<i>Asclepias subverticillata</i>		3.85	0.74
upright prairie coneflower	<i>Ratibida columnifera</i>		3.65	0.73
prostrate vervain	<i>Verbena bracteata</i>		0.20	0.20
scarlet gaura	<i>Gaura coccinea</i>		2.84	0.67
scarlet globemallow	<i>Sphaeralcea coccinea</i>		1.01	0.44
short-ray prairie coneflower	<i>Ratibida tagetes</i>		2.64	0.65
stinking milkvetch	<i>Astragalus praelongus var. ellisiae</i>		0.20	0.20
UF10	<i>Chenopodiaceae</i>		0.81	0.40
UF12	<i>Fabaceae</i>		0.20	0.20
wavyleaf thistle	<i>Cirsium undulatum</i>		1.62	0.54
western ragweed	<i>Ambrosia psilostachya</i>		4.26	0.76
white sweetclover	<i>Melilotus alba</i>		0.61	0.35
winecup	<i>Callirhoe involucrata</i>		5.48	0.79
<b>Other annual forbs</b>			7.51	3.04
common sunflower	<i>Helianthus annuus</i>		0.61	0.35
conyza	<i>Conyza canadensis</i>		2.43	0.63
kochia	<i>Kochia scoparia</i>		0.61	0.35
prickly lettuce	<i>Lactuca serriola</i>		0.20	0.20
Russian thistle	<i>Salsola iberica</i>		0.41	0.28
salsify	<i>Tragopogon dubius</i>		0.20	0.20
thyme-leaved spurge	<i>Chamaesyce serpyllifolia ssp. serpyllifolia</i>		1.01	0.44
velvet gaura	<i>Gaura parviflora</i>		2.03	0.59
<b>Shrubs</b>		2-10	0.61	0.35
fourwing saltbush	<i>Atriplex canescens</i>	0-5	0.00	0.00
rubber rabbitbrush	<i>Ericameria nauseosa ssp. nauseosa</i>	1-2	0.00	0.00
<b>Other shrubs</b>		1-3	0.61	0.35
willow	<i>Salix sp.</i>		0.61	0.35

<b>Ground Cover</b>	
Type	% Cover
Plant	43.61
Litter	55.00
Bare	1.39
Rock	0.00
n	360

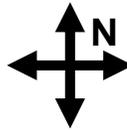


**Figure 65: Salt Meadow C Plant Group Composition** - This graph depicts the current plant group composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that plant group on the Ecological Site. The yellow is the current group composition.



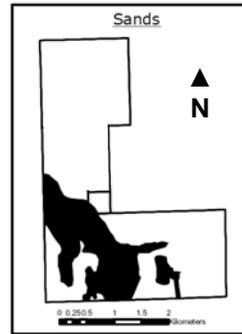
**Figure 64: Salt Meadow C Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

## Salt Meadow C



**Figure 66: Photographs of Salt Meadow C** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.



**Sands:****Site Type:** Rangeland**Site Name:** Sands**Site ID:** R067BY015CO**Major Land Resource Area:** 67B - Central High Plains, Southern Part**Soil Classification:** Ustic Torriothents\***Physiographic Features**

This site occurs on nearly level to moderately steep dunes, plains, and hills. These areas do not have a well defined surface drainage pattern. There is no significant flooding or ponding. This site has a runoff class of negligible to low.

**Soil Features**

The soils of this site are very deep, excessively to somewhat excessively drained, and are rapidly or very rapidly permeable. These soils occur on sand hills, dunes, and sandy plains. Blowouts occur where the surface has been disturbed. The available water capacity is typically low. The soil surface layer is typically 3 to 20 inches thick and is loamy fine sand, loamy sand, or sandy. The pH is typically neutral to moderately alkaline. The soil moisture regime is ustic aridic. The soil temperature regime is mesic. These soils are susceptible to wind erosion.

The Historic Climax Plant Community (HCPC) should display slight to no evidence of rills. Water flow paths, if present, are broken, irregular in appearance or discontinuous with numerous debris dams or vegetative barriers. Moving sand is inherent to this site. Wind scoured areas may exist in areas. Pedestaled plants caused by wind erosion would be minor. The soil surface is stable and intact. Sub-surface soil layers are non-restrictive to water movement and root penetration. These soils can be susceptible to erosion hazards where vegetative cover is inadequate.

Major soil series correlated to this Ecological Site include: Bijou (loamy sand), Blakeland, Dailey, Dwyer, Osgood (sand), Truckton (loamy sand), Valent, and Vona (loamy sand).

**Parent Material Kind:** eolian deposits**Parent Material Origin:** mixed**Surface Texture:** loamy fine sand, loamy sand, sand**Surface Texture Modifier:** none**Subsurface Texture Group:** sandy**Surface Fragments < 3" (% Cover):** 0**Surface Fragments > 3" (%Cover):** 0**SubSurface Fragments < 3" (% Volume):** 0 - 15**Subsurface Fragments > 3" (% Volume):** 0**Drainage Class:** somewhat - excessively excessively**Permeability Class:** moderately rapid - very rapid**Depth (inches):** 80**Electrical Conductivity (mmhos/cm)\*\*:** 0 - 2**Sodium Absorption Ratio\*\*:** 0**Soil Reaction (1:1 Water)\*\*:** 6.1 - 8.4**Available Water Capacity (inches)\*\*:** 3 - 6**Calcium Carbonate Equivalent (percent)\*\*:** 0 - 15

\* A complete soil classification table for Kiowa County is located in Appendix E.

\*\*These attributes represent 0-40 inches in depth or to the first restrictive layer.

**Historic Climax Plant Community:**

The historic climax plant community (description follows) has been determined by study of rangeland relic areas, areas protected from excessive disturbance, seasonal use pastures, short durational/time controlled grazing and historical accounts.

The plant community described should not necessarily be thought of as the "Desired Plant Community". According to the USDA NRCS National Range and Pasture Handbook, Desired Plant Communities will be determined by the decision-makers and will meet minimum quality criteria established by the NRCS. The main purpose for, including any description of a plant community here is to capture the current knowledge and experience at the time.

**Sand Bluestem, Prairie Sandreed, Western Sandcherry Plant Community**

This is the interpretive plant community and is considered to be the Historic Climax Plant Community (HCPC). This plant community evolved with grazing by large herbivores, is well suited for grazing by domestic livestock and can be found on areas that are properly managed with grazing that allows adequate recovery periods following each grazing occurrence during the growing season.

The historic climax plant community consists chiefly of tall warm season grasses. Principle dominants are sand bluestem, prairie sandreed, switchgrass and yellow Indiangrass. Sub-dominant grasses include needleandthread, blue grama and little bluestem. Significant forbs and shrubs are pacific peavine, evening primrose, prairie clovers, leadplant and western sandcherry. The potential vegetation is about 70-85% grasses and grass-like plants, 8-15% forbs and 7-15% woody plants.

Prescribed grazing that allows for adequate recovery periods after each grazing event and proper stocking will maintain this plant community. Spring grazing and summer deferment will reduce the cool season component of this plant community and increase the warm season component. Spring deferment and summer grazing will increase the cool season component and decrease the warm season component of this plant community.

This plant community is well adapted to the Northern Great Plains climatic conditions and is resistant to many disturbances except continuous grazing, plowing, uncontrolled fire events and urban as well as other land use development. The diversity in plant species allows for high drought tolerance. Plant litter is properly distributed with very little movement off-site and natural plant mortality is very low. This is a sustainable plant community in terms of soil stability, watershed function and biologic integrity.

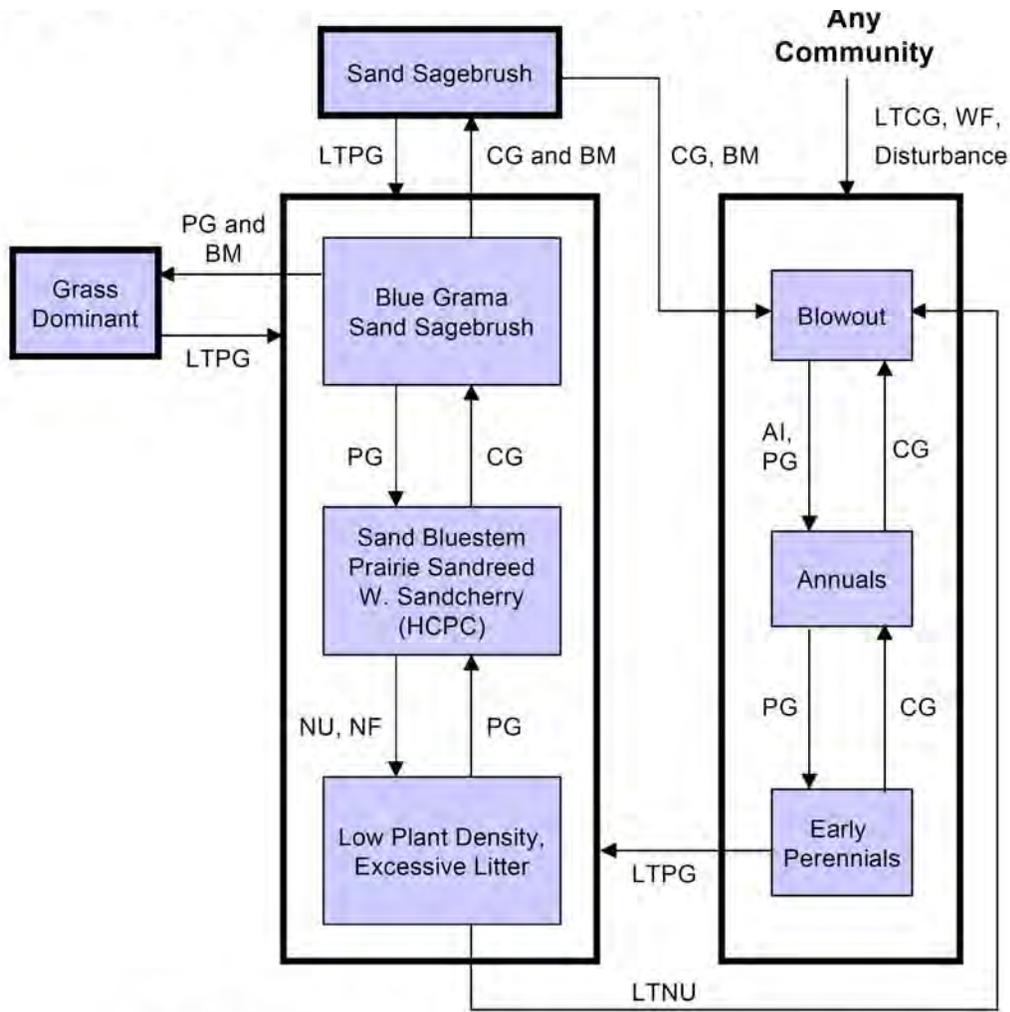
Production in this community can vary from 1200 to 2400 pounds of air-dry vegetation per acre per year depending on weather conditions and will average 1850 pounds.

**Plant Communities and Transitional Pathways**

Continuous grazing without adequate recovery opportunities following each grazing event during the growing season will initially cause blue grama and sand sagebrush to increase. Species such as sand bluestem, yellow Indiangrass, switchgrass, prairie sandreed, western sandcherry, leadplant and palatable forbs will decrease in frequency and production. Brush management (spraying) will initially reduce sand sagebrush as well as other forbs and shrubs. Brush management followed by continuous grazing can eliminate remaining grass leaving established or reestablishing sagebrush. Prescribed grazing that allows adequate recovery periods following brush management will result in a grass dominated plant community. Long

term non-use, continuous grazing, wildfire, brush management or any type of physical disturbance can lead to serious erosion problems on these fragile soils.

The following diagram illustrates the common plant communities that can occur on the site and the transition pathways (arrows) among communities. Bold lines surrounding each plant community or communities represent ecological thresholds (USDA, NRCS 2004). The ecological processes are discussed in more detail in the Ecological Site Description from the NRCS Field Office Technical Guide.



**AI** - animal impact, **BM** - brush management, **CG** - continuous grazing without adequate recovery period, **HCPC** - Historic Climax Plant Community, **LTCG** - long term continuous grazing (>25 yrs), **LTNU** - long term non-use (>25 yrs), **LTPG** - long term prescribed grazing (>20 yrs), **NF** - no fire, **NU** - non-use, **PG** - prescribed grazing with adequate recovery period, **WF** - wildfire

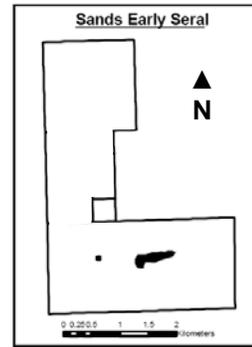
**Figure 67: Sands State and Transition Model** - Diagram of the Sands Ecological Site MRLA 67B community states and transitions (USDA, NRCS 2004).

## Sands Early Seral

The Sands Early Seral stratum is located on southwest portion of the property. Sands Early Seral is southwest of Sand Creek and occupies NPS land on sections 25 T17S R46W and 30 T17S R45W.

This area has transitioned to a **Low Plant Density, Excessive Litter Plant Community**, a state that usually occurs when grazing is removed for long periods of time or in the absence of fire. The dominant grasses from the HCPC, sand bluestem, prairie sandreed, switchgrass, and yellow Indiangrass, were not detected. The current dominant grass species were detected at 15.69% ( $\pm 0.77$ ) sand dropseed and 11.96% ( $\pm 0.95$ ) blue grama. The dominant forbs from the HCPC, Pacific peavine, purple prairie clover, dotted gayfeather, narrowleaf penstemon, and silky prairie clover, were not detected. The current dominant forb species were mostly annuals and were detected at a relative abundance of 8.82% ( $\pm 0.98$ ) Russian thistle, 11.37% ( $\pm 0.97$ ) woolly Indianwheat, 5.69% ( $\pm 0.83$ ) pepperpod mustard, and 5.10% ( $\pm 0.86$ ) common sunflower. The dominant shrubs of the HCPC, western sandcherry and leadplant, were not detected. Sand sagebrush was the dominant shrub at 8.43% ( $\pm 0.97$ ), almost twice the abundance in the HCPC. Small soapweed was detected at a suitable amount for the HCPC, 0.20% ( $\pm 0.20$ ).

Much of the nutrients in the Low Plant Density, Excessive Litter Plant Community are tied up in excessive litter and this has slowed nutrient cycling. Above ground litter also limits sunlight from reaching plant crowns and reduces seed germination and establishment. This plant community has the ability to change rapidly. Although many of the dominant species of the HCPC are not found within the Sands Early Seral stratum, most of the species are found within the SCMNHS. Species not found on the SCMNHS include: yellow Indiangrass, Pacific peavine, narrowleaf penstemon, silky prairie clover, western sandcherry, and leadplant. However, these species may be present on neighboring lands.



## Sands Early Seral

**Site Type:** Rangeland

**Site Name:** Sands

**Site ID:** R067BY015CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 100

**Date:** June 2005

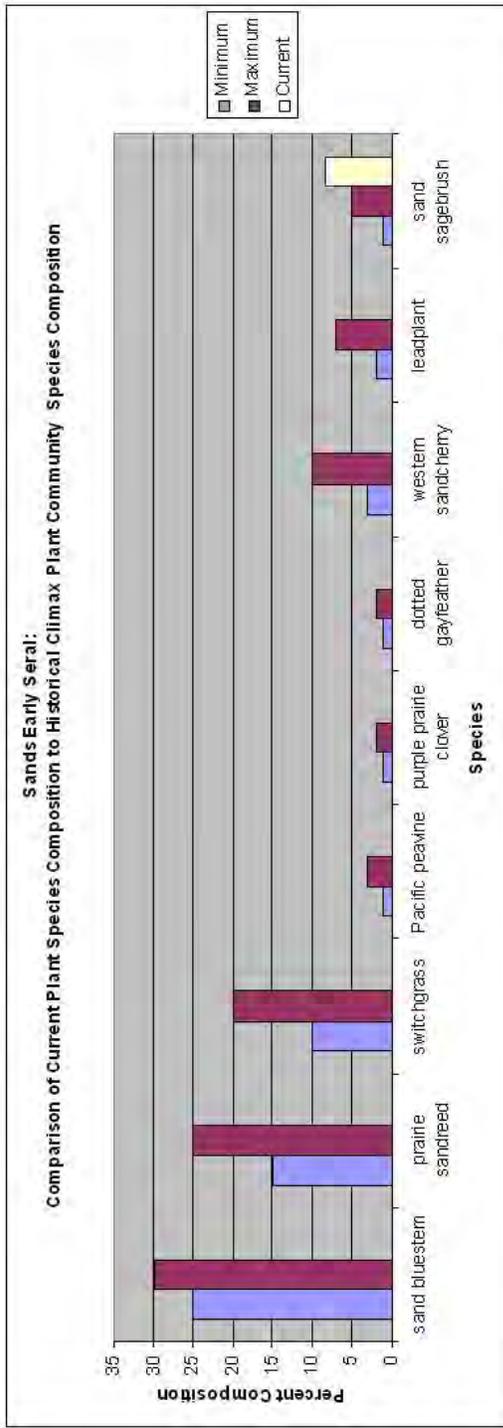
**Table 24: Sands Early Seral Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>				
sand bluestem	<i>Andropogon hallii</i>	25-30	0.00	0.00
prairie sandreed	<i>Calamovilfa longifolia</i>	15-25	0.00	0.00
switchgrass	<i>Panicum virgatum</i>	10-20	0.00	0.00
yellow Indiangrass	<i>Sorghastrum nutans</i>	5-10	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	3-7	0.00	0.00
blue grama	<i>Bouteloua gracilis</i>	1-5	11.96	0.95
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.00	0.00
blowout grass	<i>Redfieldia flexuosa</i>	1-2	0.00	0.00
hairy grama	<i>Bouteloua hirsuta</i>	1-2	0.00	0.00
Indian ricegrass	<i>Achnatherum hymenoides</i>	1-2	0.00	0.00
sand dropseed	<i>Sporobolus cryptandrus</i>	1-2	15.69	0.77
western wheatgrass	<i>Pascopyrum smithii</i>	1-2	0.98	0.43
sideoats grama	<i>Bouteloua curtipendula</i>	0-3	0.00	0.00
bottlebrush squirreltail	<i>Elymus elymoides</i>	0-1	0.59	0.34
prairie junegrass	<i>Koeleria macrantha</i>	0-1	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	0-1	0.78	0.39
sand paspalum	<i>Paspalum setaceum</i>	0-1	0.00	0.00
sandhill muhly	<i>Muhlenbergia pungens</i>	0-1	0.00	0.00
thickspike wheatgrass	<i>Elymus lanceolatus ssp. lanceolatus</i>	0-1	0.00	0.00
sand flatsedge	<i>Cyperus schweinitzii</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
thinstem flatsedge	<i>Cyperus lupulinus</i>	0-1	0.00	0.00
<b>Other native grasses and grasslikes</b>		0-3	3.33	1.09
alkali sacaton	<i>Sporobolus airoides</i>		0.00	0.00
buffalograss	<i>Buchloe dactyloides</i>		1.37	0.50
galleta	<i>Hilaria jamesii</i>		0.00	0.00
inland saltgrass	<i>Distichlis spicata</i>		1.96	0.59
<b>Forbs</b>				
Pacific peavine	<i>Lathyrus polymorphus</i>	1-3	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	1-2	0.00	0.00
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
silky prairie clover	<i>Dalea villosa</i>	1-2	0.00	0.00

annual buckwheat	<i>Eriogonum annuum</i>	0-1	0.00	0.00
bigtop dalea	<i>Dalea enneandra</i>	0-1	0.00	0.00
bush morning glory	<i>Ipomoea leptophylla</i>	0-1	0.00	0.00
death camas	<i>Zigadenus venenosus</i>	0-1	0.00	0.00
hairy goldenaster	<i>Heterotheca villosa</i>	0-1	0.00	0.00
heath aster	<i>Symphyotrichum ericoides</i>	0-1	4.51	0.83
Hoods phlox	<i>Phlox hoodii</i>	0-1	0.00	0.00
lemon scurfpea	<i>Psoralegium lanceolatum</i>	0-1	0.00	0.00
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.00	0.00
Nuttalls evolvulus	<i>Evolvulus nuttallianus</i>	0-1	0.00	0.00
othake	<i>Palafoxia sphacelata</i>	0-1	0.00	0.00
painted milkvetch	<i>Astragalus ceramicus var. filifolius</i>	0-1	0.00	0.00
pale evening primrose	<i>Oenothera albicaulis</i>	0-1	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	0-1	0.39	0.28
prairie larkspur	<i>Delphinium carolinianum</i>	0-1	0.00	0.00
prairie spiderwort	<i>Tradescantia occidentalis</i>	0-1	0.00	0.00
sand lily	<i>Leucocrinum montanum</i>	0-1	0.00	0.00
snowball sand verbena	<i>Ambronia fragans</i>	0-1	0.98	0.43
scarlet globemallow	<i>Sphaeralcea coccinea</i>	0-1	0.20	0.20
stiff sunflower	<i>Helianthus pauciflorus ssp. pauciflorus</i>	0-1	0.00	0.00
western ragweed	<i>Ambrosia psilostachya</i>	0-1	0.39	0.28
white prairie clover	<i>Dalea candida</i>	0-1	0.00	0.00
woolly Indianwheat	<i>Plantago patagonica</i>	0-1	11.37	0.97
<b>Other native forbs</b>		2-5	28.24	7.95
Astragalus sp. #5	<i>Astragalus sp.</i>		1.57	0.53
beggars tick	<i>Cryptantha circumscissa</i>		2.55	0.66
buffalo bur	<i>Solanum rostratum</i>		0.20	0.20
Chenopodium sp. #1	<i>Chenopodium sp.</i>		1.57	0.53
Chenopodium sp. #2	<i>Chenopodium sp.</i>		1.18	0.47
common sunflower	<i>Helianthus annuus</i>		5.10	0.86
conyza	<i>Conyza canadensis</i>		2.55	0.66
curlycup gumweed	<i>Grindelia squarrosa</i>		0.39	0.28
cutleaf daisy	<i>Erigeron compositus</i>		0.39	0.28
ironplant goldenweed	<i>Haplopappus spinulosus</i>		0.78	0.39
pepperpod mustard	<i>Lepidium densiflorum</i>		5.69	0.89
slimflower scurfpea	<i>Psoralegium tenuiflorum</i>		1.18	0.47
stickleaf mentzilia	<i>Mentzelia decapetala</i>		2.16	0.62
wavyleaf thistle	<i>Cirsium undulatum</i>		0.39	0.28
western fleabane	<i>Erigeron bellidiastrum</i>		2.35	0.64
woolly locoweed	<i>Astragalus mollissimus</i>		0.20	0.20
<b>Non-native forbs</b>		0	11.96	1.70
kochia	<i>Kochia scoparia</i>		3.14	0.72
Russian thistle	<i>Salsola iberica</i>		8.82	0.98
<b>Shrubs</b>				
western sandcherry	<i>Prunus pumila</i>	3-10	0.00	0.00
leadplant	<i>Amorpha canescens</i>	2-7	0.00	0.00
sand sagebrush	<i>Artemisia filifolia</i>	1-5	8.43	0.97
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.00	0.00
prairie rose	<i>Rosa arkansana</i>	0-1	0.00	0.00

purple pincushion	<i>Escobaria vivipara</i> var. <i>vivipara</i>	0-1	0.00	0.00
skunkbrush sumac	<i>Rhus trilobata</i>	0-1	0.00	0.00
spreading buckwheat	<i>Eriogonum effusum</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.20	0.20
<b>Other native shrubs</b>		1-3	0.00	0.00

<b>Ground Cover</b>	
Type	
Plant	29.67
Litter	55.00
Bare	15.33
Rock	0.00
n	600



**Figure 68: Sands Early Seral Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

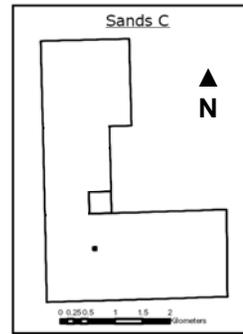
## Sands Early Seral



**Figure 69: Photographs of Sands Early Seral** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Sands C

The Sands C stratum is located on southwest portion of the property. Sands C is southwest of Sand Creek and occupies NPS land on section 25 T17S R46W. Sampling on this stratum was conducted differently than others. Due to the small area of the stratum the transects were doubled back after shifting over one meter and transects sometimes crossed.



This area has transitioned to an **Annuals Plant Community**, a state usually reached through continuous grazing. This area surrounds a water tank and was heavily disturbed. Much of the plant community is dominated by non-native annual forbs, chiefly Russian thistle and kochia. The dominant grasses from the HCPC, sand bluestem, prairie sandreed, switchgrass, and yellow Indiangrass, were not detected. The current dominant grass species were detected at 15.50% ( $\pm 1.32$ ) sand dropseed and 11.81% ( $\pm 1.44$ ) blue grama. The dominant forbs from the HCPC, Pacific peavine, purple prairie clover, dotted gayfeather, narrowleaf penstemon, and silky prairie clover, were not detected. The current dominant forb species were mostly annuals and were detected at a relative abundance of 19.56% ( $\pm 0.93$ ) kochia, 11.07% ( $\pm 1.44$ ) Russian thistle, and 7.01% ( $\pm 1.34$ ) pepperpod mustard. The dominant shrubs of the HCPC, western sandcherry and leadplant, were not detected. Sand sagebrush was the dominant shrub at 7.75% ( $\pm 1.37$ ), almost twice the abundance in the HCPC. Small soapweed was detected at a suitable amount for the HCPC, 0.37% ( $\pm 0.37$ ).

Annuals Plant Community this area has a large composition of annual forbs and is prone to blowout. Wind erosion is a concern. Although many of the dominant species of the HCPC are not found within the Sands C stratum, most of the species are found within the SCMNHs. Species not found on the SCMNHs include: yellow Indiangrass, Pacific peavine, narrowleaf penstemon, silky prairie clover, western sandcherry, and leadplant. However, these species may be present on neighboring lands.

## Sands C

**Site Type:** Rangeland

**Site Name:** Sands

**Site ID:** R067BY015CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 100

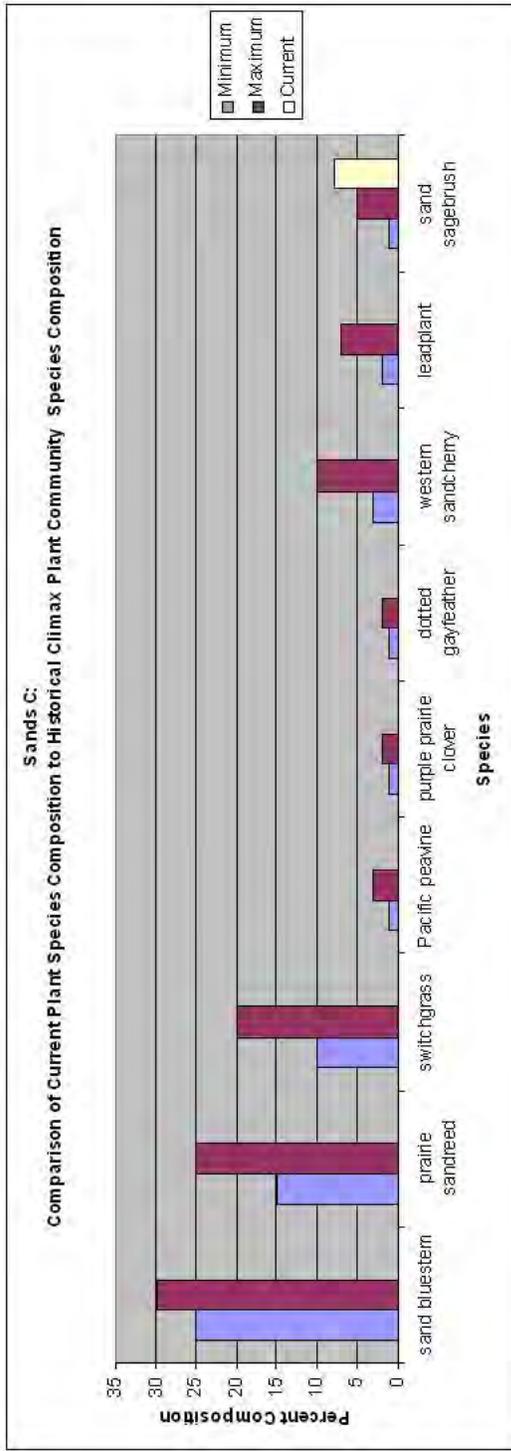
**Date:** June 2005

**Table 25: Sands C Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>				
sand bluestem	<i>Andropogon hallii</i>	25-30	0.00	0.00
prairie sandreed	<i>Calamovilfa longifolia</i>	15-25	0.00	0.00
switchgrass	<i>Panicum virgatum</i>	10-20	0.00	0.00
yellow Indiangrass	<i>Sorghastrum nutans</i>	5-10	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	3-7	0.00	0.00
blue grama	<i>Bouteloua gracilis</i>	1-5	11.81	1.44
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.00	0.00
blowout grass	<i>Redfieldia flexuosa</i>	1-2	0.00	0.00
hairy grama	<i>Bouteloua hirsuta</i>	1-2	0.00	0.00
Indian ricegrass	<i>Achnatherum hymenoides</i>	1-2	0.00	0.00
sand dropseed	<i>Sporobolus cryptandrus</i>	1-2	15.50	1.32
western wheatgrass	<i>Pascopyrum smithii</i>	1-2	0.00	0.00
sideoats grama	<i>Bouteloua curtipendula</i>	0-3	0.00	0.00
bottlebrush squirreltail	<i>Elymus elymoides</i>	0-1	0.37	0.37
prairie junegrass	<i>Koeleria macrantha</i>	0-1	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	0-1	1.11	0.63
sand paspalum	<i>Paspalum setaceum</i>	0-1	0.00	0.00
sandhill muhly	<i>Muhlenbergia pungens</i>	0-1	0.00	0.00
thickspike wheatgrass	<i>Elymus lanceolatus ssp. lanceolatus</i>	0-1	0.00	0.00
sand flatsedge	<i>Cyperus schweinitzii</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
thinstem flatsedge	<i>Cyperus lupulinus</i>	0-1	0.00	0.00
<b>Other native grasses</b>		0-3	4.43	1.72
inland saltgrass	<i>Distichlis spicata</i>		1.85	0.80
buffalograss	<i>Buchloe dactyloides</i>		2.58	0.93
<b>Forbs</b>				
Pacific peavine	<i>Lathyrus polymorphus</i>	1-3	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	1-2	0.00	0.00
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
silky prairie clover	<i>Dalea villosa</i>	1-2	0.00	0.00
annual buckwheat	<i>Eriogonum annuum</i>	0-1	0.00	0.00
bigtop dalea	<i>Dalea enneandra</i>	0-1	0.00	0.00
bush morning glory	<i>Ipomoea leptophylla</i>	0-1	0.00	0.00

death camas	<i>Zigadenus venenosus</i>	0-1	0.00	0.00
hairy goldenaster	<i>Heterotheca villosa</i>	0-1	0.00	0.00
heath aster	<i>Symphotrichum ericoides</i>	0-1	0.00	0.00
Hoods phlox	<i>Phlox hoodii</i>	0-1	0.00	0.00
lemon scurfpea	<i>Psoralidium lanceolatum</i>	0-1	0.00	0.00
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.00	0.00
Nuttalls evolvulus	<i>Evolvulus nuttallianus</i>	0-1	0.00	0.00
othake	<i>Palafoxia sphacelata</i>	0-1	0.00	0.00
painted milkvetch	<i>Astragalus ceramicus</i> var. <i>filifolius</i>	0-1	0.00	0.00
pale evening primrose	<i>Oenothera albicaulis</i>	0-1	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	0-1	0.00	0.00
prairie larkspur	<i>Delphinium carolinianum</i>	0-1	0.00	0.00
prairie spiderwort	<i>Tradescantia occidentalis</i>	0-1	0.00	0.00
sand lily	<i>Leucocrinum montanum</i>	0-1	0.00	0.00
snowball sand verbena	<i>Ambrosia fragans</i>	0-1	0.00	0.00
scarlet globemallow	<i>Sphaeralcea coccinea</i>	0-1	0.00	0.00
stiff sunflower	<i>Helianthus pauciflorus</i> ssp. <i>pauciflorus</i>	0-1	0.00	0.00
western ragweed	<i>Ambrosia psilostachya</i>	0-1	0.74	0.52
white prairie clover	<i>Dalea candida</i>	0-1	0.00	0.00
woolly Indianwheat	<i>Plantago patagonica</i>	0-1	2.95	0.98
<b>Other native forbs</b>		2-5	17.34	5.94
Astragalus sp. #5	<i>Astragalus</i> sp.		0.37	0.37
Chenopodium sp. #2	<i>Chenopodium</i> sp.		2.95	0.98
conyza	<i>Conyza canadensis</i>		2.95	0.98
curlycup gumweed	<i>Grindelia squarrosa</i>		2.21	0.86
ironplant goldenweed	<i>Haplopappus spinulosus</i>		0.74	0.52
pepperpod mustard	<i>Lepidium densiflorum</i>		7.01	1.34
wavyleaf thistle	<i>Cirsium undulatum</i>		0.37	0.37
woolly locoweed	<i>Astragalus mollissimus</i>		0.74	0.52
<b>Non native forbs</b>		0	30.63	2.37
kochia	<i>Kochia scoparia</i>		19.56	0.93
Russian thistle	<i>Salsola iberica</i>		11.07	1.44
<b>Shrubs</b>				
western sandcherry	<i>Prunus pumila</i>	3-10	0.00	0.00
leadplant	<i>Amorpha canescens</i>	2-7	0.00	0.00
sand sagebrush	<i>Artemisia filifolia</i>	1-5	7.75	1.37
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.00	0.00
prairie rose	<i>Rosa arkansana</i>	0-1	0.00	0.00
purple pincushion	<i>Escobaria vivipara</i> var. <i>vivipara</i>	0-1	0.00	0.00
skunkbrush sumac	<i>Rhus trilobata</i>	0-1	0.00	0.00
spreading buckwheat	<i>Eriogonum effusum</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.37	0.37
<b>Other native shrubs</b>		1-3	0.00	0.00
<b>Ground Cover</b>				
Type	% Cover			
Plant	33.61			
Litter	56.94			
Bare	9.44			
Rock	0.00			

| n | 360 |



**Figure 70: Sands C Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

## Sands C



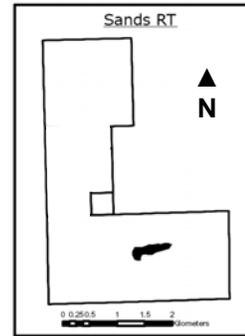
**Figure 71: Photographs of Sands C** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Sands RT

The Sands RT stratum is located on south portion of the property. Sands RT is southwest of Sand Creek and occupies NPS land on section 25 T17S R46W and section 30 T17S R45W.

This area has transitioned to a **Low Plant Density, Excessive Litter Plant Community**, a state that usually occurs when grazing is removed for long periods of time or in the absence of fire. The dominant grasses from the HCPC, sand bluestem, prairie sandreed, switchgrass, and yellow Indiangrass, were not detected. The current dominant grass species were detected at 15.98% ( $\pm 0.41$ ) sand dropseed and 12.30% ( $\pm 1.14$ ) blue grama. The dominant forbs from the HCPC, Pacific peavine, purple prairie clover, dotted gayfeather, narrowleaf penstemon, and silky prairie clover, were not detected. The current dominant forb species were mostly annuals and were detected at a relative abundance of 10.66% ( $\pm 1.25$ ) common sunflower, 6.56% ( $\pm 1.29$ ) Russian thistle, and 6.15% ( $\pm 1.27$ ) woolly Indianwheat. The dominant shrubs of the HCPC, western sandcherry and leadplant, were not detected. Sand sagebrush was the dominant shrub at 8.38% ( $\pm 0.75$ ), almost twice the abundance in the HCPC.

Much of the nutrients in the Low Plant Density, Excessive Litter Plant Community are tied up in excessive litter and this has slowed nutrient cycling. Above ground litter also limits sunlight from reaching plant crowns and reduces seed germination and establishment. This plant community has the ability to change rapidly. Although many of the dominant species of the HCPC are not found within the Sands RT stratum, most of the species are found within the SCMNHs. Species not found on the SCMNHs include: yellow Indiangrass, Pacific peavine, narrowleaf penstemon, silky prairie clover, western sandcherry, and leadplant. However, these species may be present on neighboring lands.



## Sands RT

**Site Type:** Rangeland

**Site Name:** Sands

**Site ID:** R067BY015CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 40

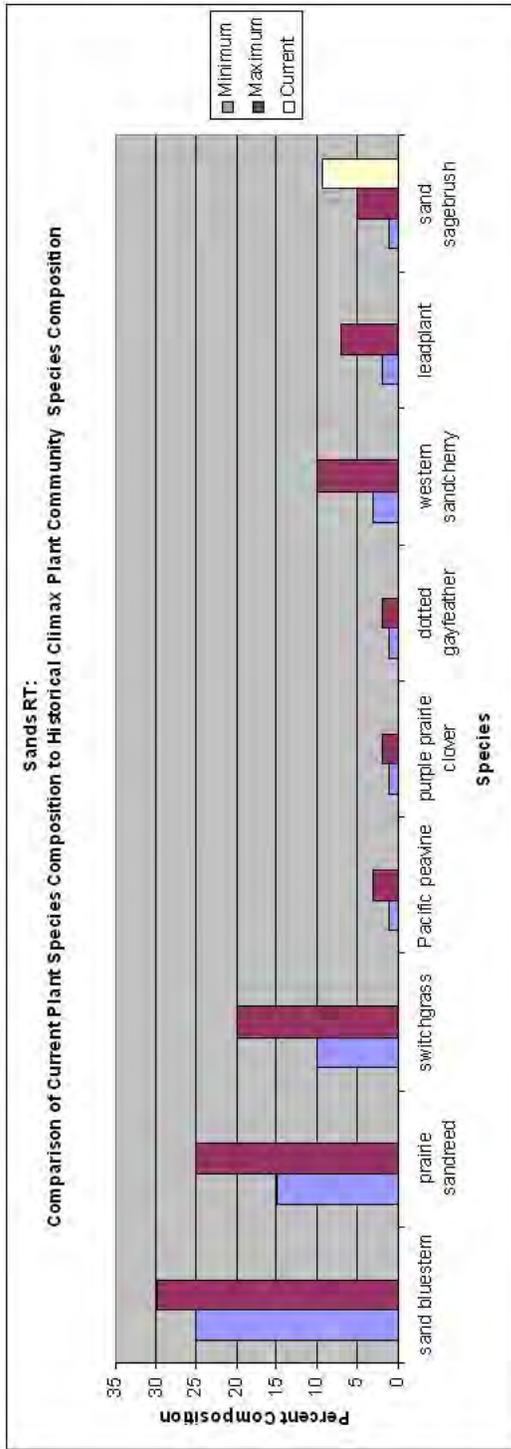
**Date:** June 2005

**Table 26: Sands RT Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>				
sand bluestem	<i>Andropogon hallii</i>	25-30	0.00	0.00
prairie sandreed	<i>Calamovilfa longifolia</i>	15-25	0.00	0.00
switchgrass	<i>Panicum virgatum</i>	10-20	0.00	0.00
yellow Indiangrass	<i>Sorghastrum nutans</i>	5-10	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	3-7	0.00	0.00
blue grama	<i>Bouteloua gracilis</i>	1-5	12.30	1.14
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.00	0.00
blowout grass	<i>Redfieldia flexuosa</i>	1-2	0.00	0.00
hairy grama	<i>Bouteloua hirsuta</i>	1-2	0.00	0.00
Indian ricegrass	<i>Achnatherum hymenoides</i>	1-2	0.00	0.00
sand dropseed	<i>Sporobolus cryptandrus</i>	1-2	15.98	0.41
western wheatgrass	<i>Pascopyrum smithii</i>	1-2	0.00	0.00
sideoats grama	<i>Bouteloua curtipendula</i>	0-3	0.00	0.00
bottlebrush squirreltail	<i>Elymus elymoides</i>	0-1	0.82	0.57
prairie junegrass	<i>Koeleria macrantha</i>	0-1	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	0-1	0.41	0.41
sand paspalum	<i>Paspalum setaceum</i>	0-1	0.00	0.00
sandhill muhly	<i>Muhlenbergia pungens</i>	0-1	0.00	0.00
thickspike wheatgrass	<i>Elymus lanceolatus ssp. lanceolatus</i>	0-1	0.00	0.00
sand flatsedge	<i>Cyperus schweinitzii</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
thinstem flatsedge	<i>Cyperus lupulinus</i>	0-1	0.00	0.00
<b>Other native grasses</b>		0-3	0.00	0.00
<b>Forbs</b>				
Pacific peavine	<i>Lathyrus polymorphus</i>	1-3	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	1-2	0.00	0.00
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
silky prairie clover	<i>Dalea villosa</i>	1-2	0.00	0.00
annual buckwheat	<i>Eriogonum annuum</i>	0-1	0.00	0.00
bigtop dalea	<i>Dalea enneandra</i>	0-1	0.00	0.00
bush morning glory	<i>Ipomoea leptophylla</i>	0-1	0.00	0.00
death camas	<i>Zigadenus venenosus</i>	0-1	0.00	0.00

hairy goldenaster	<i>Heterotheca villosa</i>	0-1	0.00	0.00
heath aster	<i>Symphotrichum ericoides</i>	0-1	0.00	0.00
Hoods phlox	<i>Phlox hoodii</i>	0-1	0.00	0.00
lemon scurfpea	<i>Psoraleidium lanceolatum</i>	0-1	0.00	0.00
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.00	0.00
Nuttalls evolvulus	<i>Evolvulus nuttallianus</i>	0-1	0.00	0.00
othake	<i>Palafoxia sphacelata</i>	0-1	0.00	0.00
painted milkvetch	<i>Astragalus ceramicus var. filifolius</i>	0-1	0.00	0.00
pale evening primrose	<i>Oenothera albicaulis</i>	0-1	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	0-1	0.82	0.57
prairie larkspur	<i>Delphinium carolinianum</i>	0-1	0.00	0.00
prairie spiderwort	<i>Tradescantia occidentalis</i>	0-1	0.00	0.00
sand lily	<i>Leucocrinum montanum</i>	0-1	0.00	0.00
snowball sand verbena	<i>Abronia fragrans</i>	0-1	2.05	0.87
scarlet globemallow	<i>Sphaeralcea coccinea</i>	0-1	0.00	0.00
stiff sunflower	<i>Helianthus pauciflorus ssp. pauciflorus</i>	0-1	0.00	0.00
western ragweed	<i>Ambrosia psilostachya</i>	0-1	0.00	0.00
white prairie clover	<i>Dalea candida</i>	0-1	0.00	0.00
woolly Indianwheat	<i>Plantago patagonica</i>	0-1	6.15	1.27
<b>Other native forbs</b>		2-5	43.03	10.71
beggars tick	<i>Cryptantha circumscissa</i>		5.33	1.23
buffalo bur	<i>Solanum rostratum</i>		0.41	0.41
Chenopodium sp. #1	<i>Chenopodium sp.</i>		3.28	1.05
Chenopodium sp. #2	<i>Chenopodium sp.</i>		5.33	1.23
common sunflower	<i>Helianthus annuus</i>		10.66	1.25
conyza	<i>Conyza canadensis</i>		3.28	1.05
cutleaf daisy	<i>Erigeron compositus</i>		0.82	0.57
pepperpod mustard	<i>Lepidium densiflorum</i>		4.10	1.14
slimflower scurfpea	<i>Psoraleidium tenuiflorum</i>		0.41	0.41
stickleaf mentzilia	<i>Mentzelia decapetala</i>		4.51	1.17
western fleabane	<i>Erigeron bellidiastrum</i>		4.92	1.20
<b>Non native forbs</b>		0	9.02	2.22
kochia	<i>Kochia scoparia</i>		2.46	0.94
Russian thistle	<i>Salsola iberica</i>		6.56	1.29
<b>Shrubs</b>				
western sandcherry	<i>Prunus pumila</i>	3-10	0.00	0.00
leadplant	<i>Amorpha canescens</i>	2-7	0.00	0.00
sand sagebrush	<i>Artemisia filifolia</i>	1-5	9.43	1.30
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.00	0.00
prairie rose	<i>Rosa arkansana</i>	0-1	0.00	0.00
purple pincushion	<i>Escobaria vivipara var. vivipara</i>	0-1	0.00	0.00
skunkbrush sumac	<i>Rhus trilobata</i>	0-1	0.00	0.00
spreading buckwheat	<i>Eriogonum effusum</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-3	0.00	0.00

Ground Cover		
Type	% Cover	Standard Error
Plant	23.75	2.73
Litter	52.08	3.64
Bare	24.17	4.09
Rock	0.00	0.00
n	240	



**Figure 72: Sands RT Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

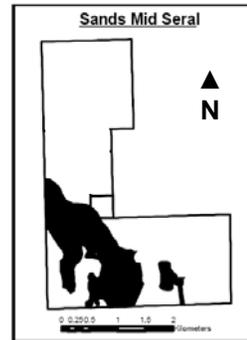
## **Sands RT**

(Pictures Unavailable)

## Sands Mid Seral

This area has transitioned to a **Blue Grama, Sagebrush Plant Community**, a state usually reached with continuous grazing. Most of the dominant grasses from the HCPC were detected but at severely reduced levels. These grasses were detected at 0.66% ( $\pm 0.15$ ) sand bluestem, 1.13% ( $\pm 0.20$ ) prairie sandreed, and 0.15% ( $\pm 0.8$ ) switchgrass. The current dominant grass species were detected at 10.89% ( $\pm 0.34$ ) blue grama, 10.51% ( $\pm 0.35$ ) sand dropseed, 3.10% ( $\pm 0.31$ ) red threeawn, and 2.27% ( $\pm 0.27$ ) buffalograss. The dominant forbs from the HCPC, Pacific peavine, purple prairie clover, dotted gayfeather, narrowleaf penstemon, and silky prairie clover, were not detected. The current dominant forb species were mostly annuals and were detected at a relative abundance of 8.36% ( $\pm 0.38$ ) woolly Indianwheat, 4.80% ( $\pm 0.35$ ) pepperpod mustard, 4.16% ( $\pm 0.33$ ) conyza, and 4.01% ( $\pm 0.33$ ) *Chenopodium* sp. #2. The dominant shrubs of the HCPC, western sandcherry and leadplant, were not detected. Brittle cactus and green rabbitbrush were the current dominant shrubs detected at 0.08% ( $\pm 0.05$ ) and 0.04% ( $\pm 0.04$ ), respectively.

The Blue Grama, Sand Sagebrush Plant Community is stable but may lose many tallgrass species, important forbs, and shrubs. This composition can jeopardize the biotic integrity of the community. This state can also alter the nutrient/water/energy cycles and is an early stage of desertification. Although many of the dominant species of the HCPC are not found within the Sands Mid Seral stratum, most of the species are found within the SCMNHS. Species not found on the SCMNHS include: yellow Indiangrass, Pacific peavine, narrowleaf penstemon, silky prairie clover, western sandcherry, and leadplant. However, these species may be present on neighboring lands.



## Sands Mid Seral

**Site Type:** Rangeland

**Site Name:** Sands

**Site ID:** R067BY015CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 400

**Date:** June 2005

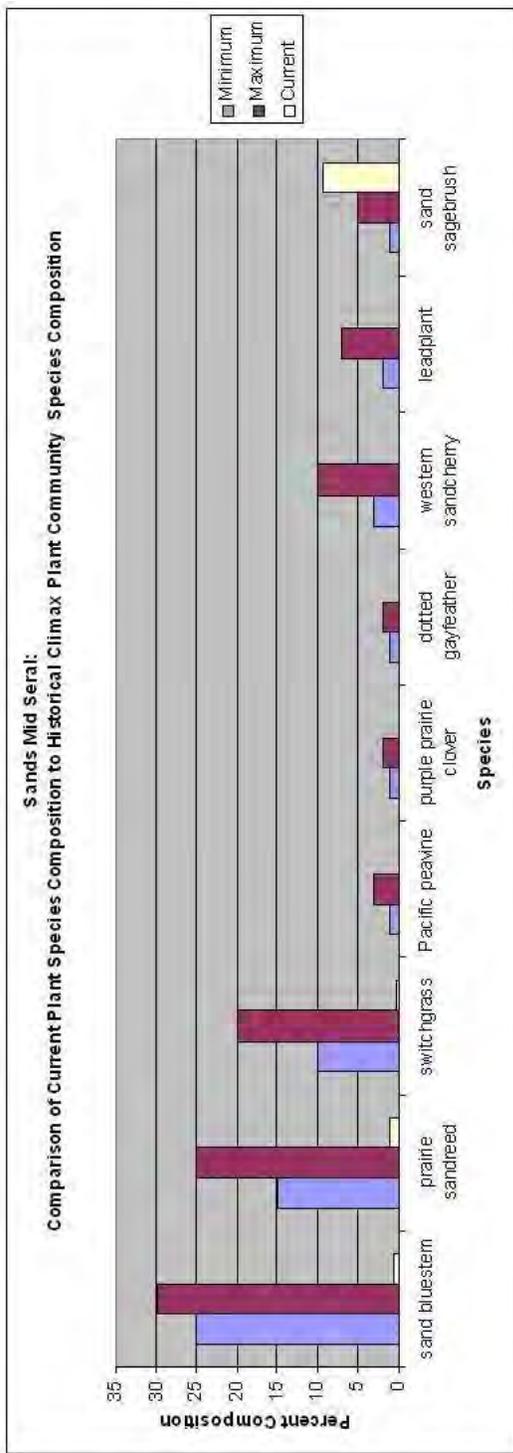
**Table 27: Sands Mid Seral Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>				
sand bluestem	<i>Andropogon hallii</i>	25-30	0.60	0.15
prairie sandreed	<i>Calamovilfa longifolia</i>	15-25	1.13	0.20
switchgrass	<i>Panicum virgatum</i>	10-20	0.15	0.08
yellow Indiangrass	<i>Sorghastrum nutans</i>	5-10	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	3-7	1.13	0.20
blue grama	<i>Bouteloua gracilis</i>	1-5	10.89	0.34
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.11	0.07
blowout grass	<i>Redfieldia flexuosa</i>	1-2	0.26	0.10
hairy grama	<i>Bouteloua hirsuta</i>	1-2	0.76	0.17
Indian ricegrass	<i>Achnatherum hymenoides</i>	1-2	0.00	0.00
sand dropseed	<i>Sporobolus cryptandrus</i>	1-2	10.51	0.35
western wheatgrass	<i>Pascopyrum smithii</i>	1-2	0.83	0.17
sideoats grama	<i>Bouteloua curtipendula</i>	0-3	0.00	0.00
bottlebrush squirreltail	<i>Elymus elymoides</i>	0-1	0.57	0.14
prairie junegrass	<i>Koeleria macrantha</i>	0-1	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	0-1	3.10	0.31
sand paspalum	<i>Paspalum setaceum</i>	0-1	0.45	0.13
sandhill muhly	<i>Muhlenbergia pungens</i>	0-1	0.00	0.00
thickspike wheatgrass	<i>Elymus lanceolatus ssp. lanceolatus</i>	0-1	0.00	0.00
sand flatsedge	<i>Cyperus schweinitzii</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.11	0.07
thinstem flatsedge	<i>Cyperus lupulinus</i>	0-1	0.00	0.00
<b>Other native grasses and grasslikes</b>		0-3	5.67	1.12
alkali sacaton	<i>Sporobolus airoides</i>		0.08	0.05
buffalograss	<i>Buchloe dactyloides</i>		2.27	0.27
galleta	<i>Hilaria jamesii</i>		0.08	0.05
inland saltgrass	<i>Distichlis spicata</i>		0.45	0.13
prairie threeawn	<i>Aristida oligantha</i>		0.23	0.09
ring muhly	<i>Muhlenbergia torreyi</i>		0.04	0.04
sand lovegrass	<i>Eragrostis trichodes</i>		0.42	0.12
sedge	<i>Carex sp.</i>		0.04	0.04
sixweeks fescue	<i>Vulpia octoflora</i>		1.97	0.25
tall dropseed	<i>Sporobolus compositus</i>		0.11	0.07

Forbs				
Pacific peavine	<i>Lathyrus polymorphus</i>	1-3	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	1-2	0.00	0.00
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
silky prairie clover	<i>Dalea villosa</i>	1-2	0.00	0.00
annual buckwheat	<i>Eriogonum annuum</i>	0-1	0.00	0.00
bigtop dalea	<i>Dalea enneandra</i>	0-1	0.19	0.08
bush morning glory	<i>Ipomoea leptophylla</i>	0-1	0.00	0.00
death camas	<i>Zigadenus venenosus</i>	0-1	0.00	0.00
hairy goldenaster	<i>Heterotheca villosa</i>	0-1	0.11	0.07
heath aster	<i>Symphyotrichum ericoides</i>	0-1	0.83	0.17
Hoods phlox	<i>Phlox hoodii</i>	0-1	0.00	0.00
lemon scurfpea	<i>Psoraleidium lanceolatum</i>	0-1	0.15	0.08
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.15	0.08
Nuttalls evolvulus	<i>Evolvulus nuttallianus</i>	0-1	0.68	0.16
othake	<i>Palafoxia sphacelata</i>	0-1	0.00	0.00
painted milkvetch	<i>Astragalus ceramicus</i> var. <i>filifolius</i>	0-1	0.00	0.00
pale evening primrose	<i>Oenothera albicaulis</i>	0-1	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	0-1	0.60	0.15
prairie larkspur	<i>Delphinium carolinianum</i>	0-1	0.00	0.00
prairie spiderwort	<i>Tradescantia occidentalis</i>	0-1	0.11	0.07
sand lily	<i>Leucocrinum montanum</i>	0-1	0.00	0.00
snowball sand verbena	<i>Ambronia fragans</i>	0-1	0.38	0.12
scarlet globemallow	<i>Sphaeralcea coccinea</i>	0-1	3.59	0.32
stiff sunflower	<i>Helianthus pauciflorus</i> ssp. <i>pauciflorus</i>	0-1	0.00	0.00
western ragweed	<i>Ambrosia psilostachya</i>	0-1	2.19	0.27
white prairie clover	<i>Dalea candida</i>	0-1	0.00	0.00
woolly Indianwheat	<i>Plantago patagonica</i>	0-1	8.36	0.38
<b>Other native forbs</b>		2-5	31.98	4.95
Astragalus sp. #3	<i>Astragalus</i> sp.		0.04	0.04
Astragalus sp. #4	<i>Astragalus</i> sp.		0.04	0.04
Astragalus sp. #5	<i>Astragalus</i> sp.		0.04	0.04
beggars tick	<i>Cryptantha circumscissa</i>		1.85	0.25
Chenopodium sp. #1	<i>Chenopodium</i> sp.		1.47	0.22
Chenopodium sp. #2	<i>Chenopodium</i> sp.		4.01	0.33
common sunflower	<i>Helianthus annuus</i>		0.64	0.15
conyza	<i>Conyza canadensis</i>		4.16	0.34
curlycup gumweed	<i>Grindelia squarrosa</i>		0.30	0.11
cutleaf daisy	<i>Erigeron compositus</i>		0.38	0.12
ironplant goldenweed	<i>Haplopappus spinulosus</i>		1.40	0.22
evening primrose	<i>Oenothera</i> spp.		0.53	0.14
flaxflowered ipomopsis	<i>Ipomopsis longiflora</i>		1.17	0.20
groundsel	<i>Senecio integerrimus</i>		0.15	0.08
Hopi tea greenthread	<i>Thelesperma megapotamicum</i>		0.23	0.09
Indianhemp dogbane	<i>Apocynum cannabinum</i>		0.15	0.08
lambsquarters	<i>Chenopodium album</i>		0.83	0.17
narrowleaf fourclock	<i>Mirabilis linearis</i>		0.19	0.08
narrowleaf stoneseed	<i>Lithospermum incisum</i>		1.02	0.19

palmleaf scurfpea	<i>Psoralea digitata</i>		0.08	0.05
pepperpod mustard	<i>Lepidium densiflorum</i>		4.80	0.35
prairie groundcherry	<i>Physalis pumila</i>		0.11	0.07
rush skeletonplant	<i>Lygodesmia juncea</i>		0.49	0.13
scarlet gaura	<i>Gaura coccinea</i>		0.68	0.16
slimflower scurfpea	<i>Psoralidium tenuiflorum</i>		1.93	0.25
streamside fleabane	<i>Erigeron glabellus subsp. pubescens</i>		0.60	0.15
stickleaf mentzilia	<i>Mentzelia decapetala</i>		0.68	0.16
narrowleaf poisonvetch	<i>Astragalus pectinatus</i>		0.08	0.05
velvet gaura	<i>Gaura parviflora</i>		0.23	0.09
wavyleaf thistle	<i>Cirsium undulatum</i>		0.30	0.11
western fleabane	<i>Erigeron bellidialstrum</i>		2.84	0.30
winecup	<i>Callirhoe involucrata</i>		0.19	0.08
woolly locoweed	<i>Astragalus mollissimus</i>		0.38	0.12
<b>Non-native forbs</b>		0	4.46	0.59
kochia	<i>Kochia scoparia</i>		2.38	0.28
redroot pigweed	<i>Amaranthus retroflexus</i>		0.08	0.05
Russian thistle	<i>Salsola iberica</i>		2.00	0.26
<b>Shrubs</b>				
western sandcherry	<i>Prunus pumila</i>	3-10	0.00	0.00
leadplant	<i>Amorpha canescens</i>	2-7	0.00	0.00
sand sagebrush	<i>Artemisia filifolia</i>	1-5	9.38	0.37
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.15	0.08
prairie rose	<i>Rosa arkansana</i>	0-1	0.00	0.00
purple pincushion	<i>Escobaria vivipara var. vivipara</i>	0-1	0.00	0.00
skunkbrush sumac	<i>Rhus trilobata</i>	0-1	0.00	0.00
spreading buckwheat	<i>Eriogonum effusum</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.26	0.10
<b>Other native shrubs</b>		1-3	0.11	0.09
brittle cactus	<i>Opuntia fragilis</i>		0.08	0.05
green rabbitbrush	<i>Chrysothamnus visidiflorus</i>		0.04	0.04

Ground Cover	
Type	% Cover
Plant	33.75
Litter	43.63
Bare	22.58
Rock	0.00
n	2400



**Figure 73: Sands Mid Seral Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

### Sands Mid Seral



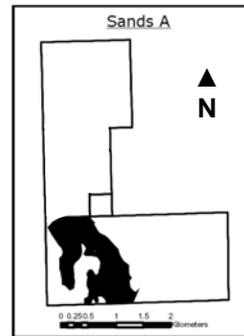
**Figure 74: Photographs of Sands Mid Seral** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Sands A

The Sands A stratum is located on southwest portion of the property. Sands A is southwest of Sand Creek and primarily occupies NPS land on section 25 T17S R46W.

This area has transitioned to a **Blue Grama, Sand Sagebrush Plant Community**, a state usually reached through continuous grazing. Most dominant grasses from the HCPC were not detected, including sand bluestem, yellow Indiangrass, and switchgrass. The other dominant grass, prairie sandreed, was detected below the HCPC level at 0.60% ( $\pm 0.29$ ). The current dominant grass species were detected at 12.57% ( $\pm 0.55$ ) blue grama, 8.23% ( $\pm 0.75$ ) sand dropseed, 7.78% ( $\pm 0.75$ ) buffalograss, and 5.39% ( $\pm 0.72$ ) red threeawn. The dominant forbs from the HCPC, Pacific peavine, purple prairie clover, dotted gayfeather, narrowleaf penstemon, and silky prairie clover, were not detected. The current dominant forb species were detected at a relative abundance of 7.78% ( $\pm 0.75$ ) *Chenopodium* sp., 7.49% ( $\pm 0.75$ ) woolly Indianwheat, 5.99% ( $\pm 0.74$ ) slimflower scurfpea, and 5.24% ( $\pm 0.72$ ) western ragweed. The dominant shrubs of the HCPC, western sandcherry and leadplant, were not detected. Sand sagebrush was the current dominant shrub at 8.38% ( $\pm 0.75$ ), almost twice the abundance in the HCPC. Plains pricklypear and small soapweed were detected at suitable amounts for the HCPC at 0.45% ( $\pm 0.26$ ) for both species.

The Blue Grama, Sand Sagebrush Plant Community is stable but may lose many tallgrass species, important forbs, and shrubs. This composition can jeopardize the biotic integrity of the community. This state can also alter the nutrient/water/energy cycles and is an early stage of desertification. Although many of the dominant species of the HCPC are not found within the Sands A stratum, most of the species are found within the SCMNHs. Species not found on the SCMNHs include: yellow Indiangrass, Pacific peavine, narrowleaf penstemon, silky prairie clover, western sandcherry, and leadplant. However, these species may be present on neighboring lands.



## Sands A

**Site Type:** Rangeland

**Site Name:** Sands

**Site ID:** R067BY015CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 100

**Date:** June 2005

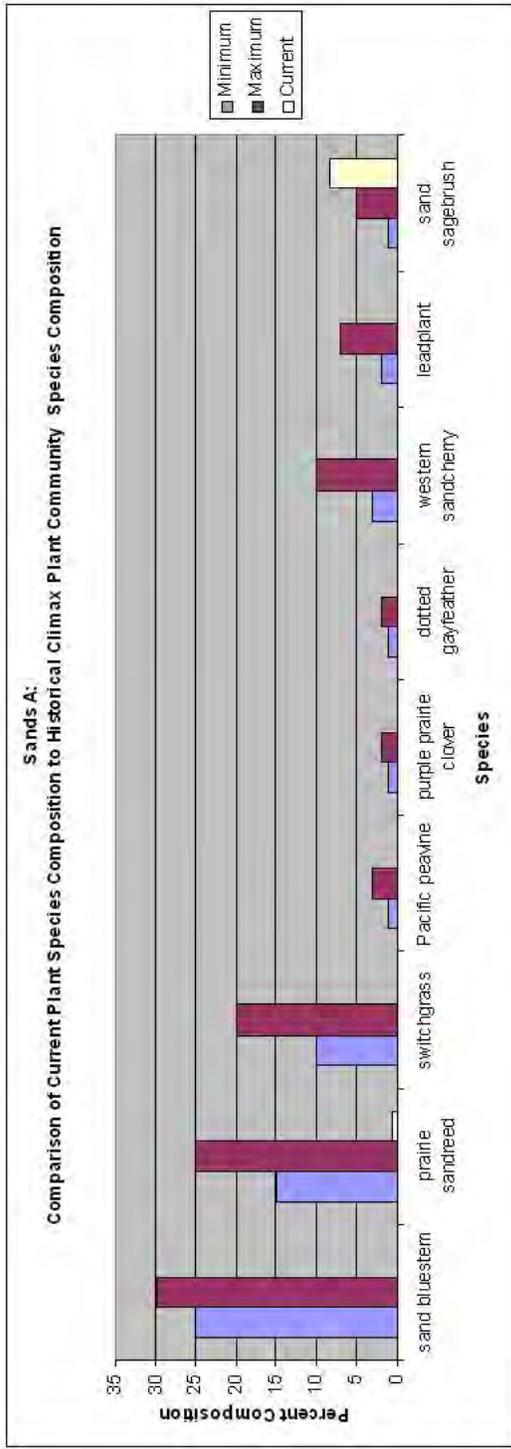
**Table 28: Sands A Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>				
sand bluestem	<i>Andropogon hallii</i>	25-30	0.00	0.00
prairie sandreed	<i>Calamoviifa longifolia</i>	15-25	0.60	0.29
switchgrass	<i>Panicum virgatum</i>	10-20	0.00	0.00
yellow Indiangrass	<i>Sorghastrum nutans</i>	5-10	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	3-7	0.00	0.00
blue grama	<i>Bouteloua gracilis</i>	1-5	12.57	0.55
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.00	0.00
blowout grass	<i>Redfieldia flexuosa</i>	1-2	0.00	0.00
hairy grama	<i>Bouteloua hirsuta</i>	1-2	0.00	0.00
Indian ricegrass	<i>Achnatherum hymenoides</i>	1-2	0.00	0.00
sand dropseed	<i>Sporobolus cryptandrus</i>	1-2	8.23	0.75
western wheatgrass	<i>Pascopyrum smithii</i>	1-2	0.00	0.00
sideoats grama	<i>Bouteloua curtipendula</i>	0-3	0.00	0.00
bottlebrush squirreltail	<i>Elymus elymoides</i>	0-1	1.05	0.38
prairie junegrass	<i>Koeleria macrantha</i>	0-1	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	0-1	5.39	0.72
sand paspalum	<i>Paspalum setaceum</i>	0-1	0.00	0.00
sandhill muhly	<i>Muhlenbergia pungens</i>	0-1	0.00	0.00
thickspike wheatgrass	<i>Elymus lanceolatus ssp. lanceolatus</i>	0-1	0.00	0.00
sand flatsedge	<i>Cyperus schweinitzii</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
thinstem flatsedge	<i>Cyperus lupulinus</i>	0-1	0.00	0.00
<b>Other native grasses</b>		0-3	9.88	1.78
buffalograss	<i>Buchloe dactyloides</i>		7.78	0.75
galleta	<i>Hilaria jamesii</i>		0.30	0.21
inland saltgrass	<i>Distichlis spicata</i>		0.45	0.26
ring muhly	<i>Muhlenbergia torreyi</i>		0.15	0.15
sixweeks fescue	<i>Vulpia octoflora</i>		1.20	0.41
<b>Forbs</b>				
Pacific peavine	<i>Lathyrus polymorphus</i>	1-3	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	1-2	0.00	0.00
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00

silky prairie clover	<i>Dalea villosa</i>	1-2	0.00	0.00
annual buckwheat	<i>Eriogonum annuum</i>	0-1	0.00	0.00
bigtop dalea	<i>Dalea enneandra</i>	0-1	0.00	0.00
bush morning glory	<i>Ipomoea leptophylla</i>	0-1	0.00	0.00
death camas	<i>Zigadenus venenosus</i>	0-1	0.00	0.00
hairy goldenaster	<i>Heterotheca villosa</i>	0-1	0.30	0.21
heath aster	<i>Symphyotrichum ericoides</i>	0-1	1.20	0.41
Hoods phlox	<i>Phlox hoodii</i>	0-1	0.00	0.00
lemon scurfpea	<i>Psoraleidium lanceolatum</i>	0-1	0.00	0.00
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.00	0.00
Nuttalls evolvulus	<i>Evolvulus nuttallianus</i>	0-1	0.75	0.33
othake	<i>Palafoxia sphacelata</i>	0-1	0.00	0.00
painted milkvetch	<i>Astragalus ceramicus var. filifolius</i>	0-1	0.00	0.00
pale evening primrose	<i>Oenothera albicaulis</i>	0-1	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	0-1	1.50	0.45
prairie larkspur	<i>Delphinium carolinianum</i>	0-1	0.00	0.00
prairie spiderwort	<i>Tradescantia occidentalis</i>	0-1	0.00	0.00
sand lily	<i>Leucocrinum montanum</i>	0-1	0.00	0.00
snowball sand verbena	<i>Ambrosia fragans</i>	0-1	0.00	0.00
scarlet globemallow	<i>Sphaeralcea coccinea</i>	0-1	1.65	0.47
stiff sunflower	<i>Helianthus pauciflorus ssp. pauciflorus</i>	0-1	0.00	0.00
western ragweed	<i>Ambrosia psilostachya</i>	0-1	5.24	0.72
white prairie clover	<i>Dalea candida</i>	0-1	0.00	0.00
woolly Indianwheat	<i>Plantago patagonica</i>	0-1	7.49	0.75
<b>Other native forbs</b>		2-5	34.28	7.72
Astragalus sp. #3	<i>Astragalus sp.</i>		0.15	0.15
Astragalus sp. #4	<i>Astragalus sp.</i>		0.15	0.15
beggars tick	<i>Cryptantha circumscissa</i>		1.05	0.38
Chenopodium sp. #1	<i>Chenopodium sp.</i>		1.50	0.45
Chenopodium sp. #2	<i>Chenopodium sp.</i>		7.78	0.75
common sunflower	<i>Helianthus annuus</i>		0.15	0.15
conyza	<i>Conyza canadensis</i>		2.10	0.52
ironplant goldenweed	<i>Haplopappus spinulosus</i>		2.40	0.55
evening primrose	<i>Oenothera spp.</i>		0.75	0.33
groundsel	<i>Senecio integerrimus</i>		0.60	0.29
narrowleaf stoneseed	<i>Lithospermum incisum</i>		0.75	0.33
palmleaf scurfpea	<i>Psoralea digitata</i>		0.30	0.21
pepperpod mustard	<i>Lepidium densiflorum</i>		2.99	0.60
rush skeletonplant	<i>Lygodesmia juncea</i>		0.60	0.29
scarlet gaura	<i>Gaura coccinea</i>		0.15	0.15
slimflower scurfpea	<i>Psoraleidium tenuiflorum</i>		5.99	0.74
narrowleaf poisonvetch	<i>Astragalus pectinatus</i>		0.30	0.21
wavyleaf thistle	<i>Cirsium undulatum</i>		0.90	0.36
western fleabane	<i>Erigeron bellidiastrum</i>		4.49	0.69
woolly locoweed	<i>Astragalus mollissimus</i>		1.20	0.41
<b>Non native forbs</b>		0	0.60	0.41
kochia	<i>Kochia scoparia</i>		0.15	0.15
Russian thistle	<i>Salsola iberica</i>		0.45	0.26

Shrubs			9.58	1.56
western sandcherry	<i>Prunus pumila</i>	3-10	0.00	0.00
leadplant	<i>Amorpha canescens</i>	2-7	0.00	0.00
sand sagebrush	<i>Artemisia filifolia</i>	1-5	8.38	0.75
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.45	0.26
prairie rose	<i>Rosa arkansana</i>	0-1	0.00	0.00
purple pincushion	<i>Escobaria vivipara var. vivipara</i>	0-1	0.00	0.00
skunkbrush sumac	<i>Rhus trilobata</i>	0-1	0.00	0.00
spreading buckwheat	<i>Eriogonum effusum</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.45	0.26
<b>Other native shrubs</b>		1-3	0.30	0.30
brittle cactus	<i>Opuntia fragilis</i>		0.15	0.15
green rabbitbrush	<i>Chrysothamnus visidiflorus</i>		0.15	0.15

Ground Cover	
Type	% Cover
Plant	30.17
Litter	50.17
Bare	19.50
Rock	0.00
n	600



**Figure 75: Sands A Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

## Sands A



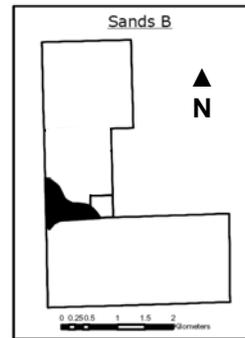
**Figure 76: Photographs of Sands A** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Sands B

The Sands B stratum is located on southwest portion of the property. Sands B is west of Sand Creek and primarily occupies NPS land on section 24 T17S R46W.

This area has transitioned to a **Blue Grama, Sand Sagebrush Plant Community**, a state usually reached through continuous grazing. Most dominant grasses from the HCPC were not detected, including sand bluestem, yellow Indiangrass, and switchgrass. The other dominant grass, prairie sandreed, was detected below the HCPC level at 0.15% ( $\pm 0.15$ ). The current dominant grass species were detected at 13.31% ( $\pm 0.45$ ) blue grama, 13.31% ( $\pm 0.45$ ) sand dropseed, and 3.85% ( $\pm 0.65$ ) sixweeks fescue. The dominant forbs from the HCPC, Pacific peavine, purple prairie clover, dotted gayfeather, narrowleaf penstemon, and silky prairie clover, were not detected. The current dominant forb species were mostly annuals and were detected at a relative abundance of 10.80% ( $\pm 0.66$ ) woolly Indianwheat, 9.76% ( $\pm 0.70$ ) conyza, 6.95% ( $\pm 0.74$ ) pepperpod mustard, and 4.29% ( $\pm 0.67$ ) flaxflowered ipomopsis. The dominant shrubs of the HCPC, western sandcherry and leadplant, were not detected. Sand sagebrush was the dominant shrub at 8.43% ( $\pm 0.74$ ), almost twice the abundance in the HCPC. Plains pricklypear and small soapweed were detected at suitable amounts for the HCPC at 0.15% ( $\pm 0.15$ ) and 0.44% ( $\pm 0.25$ ), respectively.

The Blue Grama, Sand Sagebrush Plant Community is stable but may lose many tallgrass species, important forbs, and shrubs. This composition can jeopardize the biotic integrity of the community. This state can also alter the nutrient/water/energy cycles and is an early stage of desertification. Although many of the dominant species of the HCPC are not found within the Sands B stratum, most of the species are found within the SCMNHs. Species not found on the SCMNHs include: yellow Indiangrass, Pacific peavine, narrowleaf penstemon, silky prairie clover, western sandcherry, and leadplant. However, these species may be present on neighboring lands.



## Sands B

**Site Type:** Rangeland

**Site Name:** Sands

**Site ID:** R067BY015CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 100

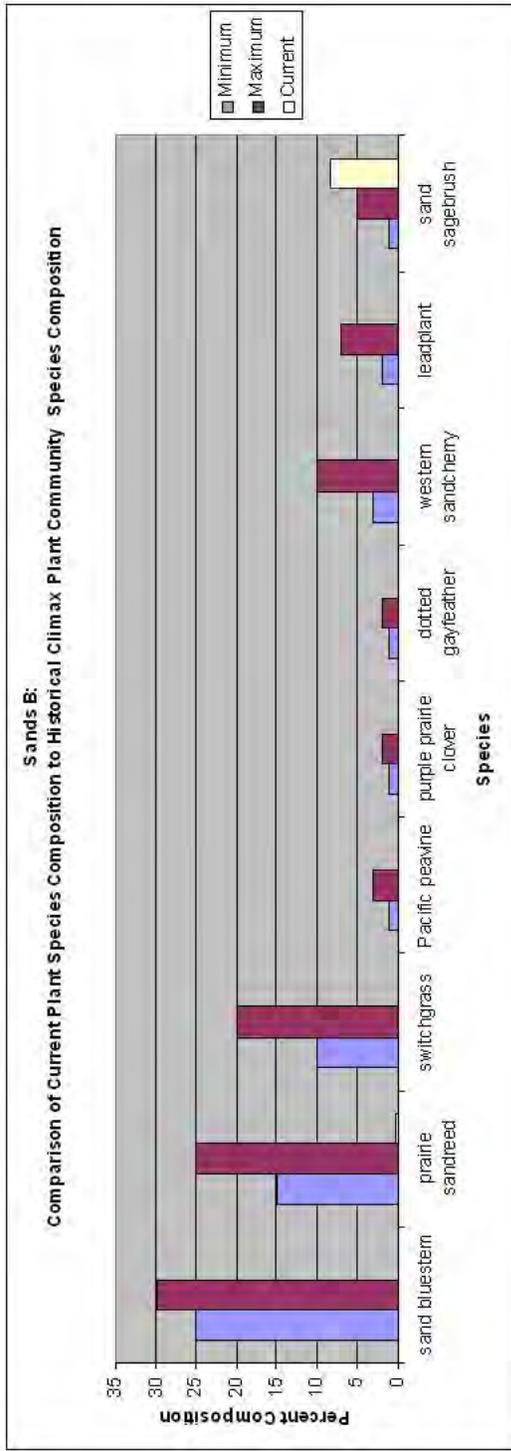
**Date:** June 2005

**Table 29: Sands B Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>				
sand bluestem	<i>Andropogon hallii</i>	25-30	0.00	0.00
prairie sandreed	<i>Calamovilfa longifolia</i>	15-25	0.15	0.15
switchgrass	<i>Panicum virgatum</i>	10-20	0.00	0.00
yellow Indiangrass	<i>Sorghastrum nutans</i>	5-10	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	3-7	0.00	0.00
blue grama	<i>Bouteloua gracilis</i>	1-5	13.31	0.45
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.00	0.00
blowout grass	<i>Redfieldia flexuosa</i>	1-2	0.00	0.00
hairy grama	<i>Bouteloua hirsuta</i>	1-2	0.00	0.00
Indian ricegrass	<i>Achnatherum hymenoides</i>	1-2	0.00	0.00
sand dropseed	<i>Sporobolus cryptandrus</i>	1-2	13.31	0.45
western wheatgrass	<i>Pascopyrum smithii</i>	1-2	0.00	0.00
sideoats grama	<i>Bouteloua curtipendula</i>	0-3	0.00	0.00
bottlebrush squirreltail	<i>Elymus elymoides</i>	0-1	0.74	0.32
prairie junegrass	<i>Koeleria macrantha</i>	0-1	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	0-1	0.15	0.15
sand paspalum	<i>Paspalum setaceum</i>	0-1	0.00	0.00
sandhill muhly	<i>Muhlenbergia pungens</i>	0-1	0.00	0.00
thickspike wheatgrass	<i>Elymus lanceolatus ssp. lanceolatus</i>	0-1	0.00	0.00
thinstem flatsedge	<i>Cyperus lupulinus</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
sand flatsedge	<i>Cyperus schweinitzii</i>	0-1	0.00	0.00
<b>Other native grasses</b>		0-3	3.85	0.65
sixweeks fescue	<i>Vulpia octoflora</i>		3.85	0.65
<b>Forbs</b>				
Pacific peavine	<i>Lathyrus polymorphus</i>	1-3	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	1-2	0.00	0.00
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
silky prairie clover	<i>Dalea villosa</i>	1-2	0.00	0.00
annual buckwheat	<i>Eriogonum annuum</i>	0-1	0.00	0.00
bigtop dalea	<i>Dalea enneandra</i>	0-1	0.00	0.00
bush morning glory	<i>Ipomoea leptophylla</i>	0-1	0.00	0.00
death camas	<i>Zigadenus venenosus</i>	0-1	0.00	0.00

hairy goldenaster	<i>Heterotheca villosa</i>	0-1	0.00	0.00
heath aster	<i>Symphotrichum ericoides</i>	0-1	0.00	0.00
Hoods phlox	<i>Phlox hoodii</i>	0-1	0.00	0.00
lemon scurfpea	<i>Psoraleidium lanceolatum</i>	0-1	0.00	0.00
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.15	0.15
Nuttalls evolvulus	<i>Evolvulus nuttallianus</i>	0-1	0.30	0.21
othake	<i>Palafoxia sphaelata</i>	0-1	0.00	0.00
painted milkvetch	<i>Astragalus ceramicus var. filifolius</i>	0-1	0.00	0.00
pale evening primrose	<i>Oenothera albicaulis</i>	0-1	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	0-1	0.74	0.32
prairie larkspur	<i>Delphinium carolinianum</i>	0-1	0.00	0.00
prairie spiderwort	<i>Tradescantia occidentalis</i>	0-1	0.15	0.15
sand lily	<i>Leucocrinum montanum</i>	0-1	0.00	0.00
snowball sand verbena	<i>Ambronia fragans</i>	0-1	0.00	0.00
scarlet globemallow	<i>Sphaeralcea coccinea</i>	0-1	0.00	0.00
stiff sunflower	<i>Helianthus pauciflorus ssp. pauciflorus</i>	0-1	0.00	0.00
western ragweed	<i>Ambrosia psilostachya</i>	0-1	0.00	0.00
white prairie clover	<i>Dalea candida</i>	0-1	0.00	0.00
woolly Indianwheat	<i>Plantago patagonica</i>	0-1	10.80	0.66
<b>Other native forbs</b>		2-5	36.54	6.64
beggars tick	<i>Cryptantha circumscissa</i>		2.81	0.58
Chenopodium sp. #1	<i>Chenopodium sp.</i>		2.07	0.52
common sunflower	<i>Helianthus annuus</i>		0.59	0.29
conyza	<i>Conyza canadensis</i>		9.76	0.70
cutleaf daisy	<i>Erigeron compositus</i>		0.89	0.35
ironplant goldenweed	<i>Haplopappus spinulosus</i>		1.04	0.38
flaxflowered ipomopsis	<i>Ipomopsis longiflora</i>		4.29	0.67
Hopi tea greenthread	<i>Thelesperma megapotamicum</i>		0.15	0.15
lambquarters	<i>Chenopodium album</i>		3.25	0.62
narrowleaf stoneseed	<i>Lithospermum incisum</i>		0.74	0.32
pepperpod mustard	<i>Lepidium densiflorum</i>		6.95	0.74
scarlet gaura	<i>Gaura coccinea</i>		1.18	0.40
streamside fleabane	<i>Erigeron glabellus subsp. pubescens</i>		2.37	0.55
stickleaf mentzilia	<i>Mentzelia decapetala</i>		0.15	0.15
winecup	<i>Callirhoe involucrata</i>		0.30	0.21
<b>Non native forbs</b>		0	1.33	0.43
Russian thistle	<i>Salsola iberica</i>		1.33	0.43
<b>Shrubs</b>				
western sandcherry	<i>Prunus pumila</i>	3-10	0.00	0.00
leadplant	<i>Amorpha canescens</i>	2-7	0.00	0.00
sand sagebrush	<i>Artemisia filifolia</i>	1-5	8.43	0.74
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.15	0.15
prairie rose	<i>Rosa arkansana</i>	0-1	0.00	0.00
purple pincushion	<i>Escobaria vivipara var. vivipara</i>	0-1	0.00	0.00
skunkbrush sumac	<i>Rhus trilobata</i>	0-1	0.00	0.00
spreading buckwheat	<i>Eriogonum effusum</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.44	0.25
<b>Other native shrubs</b>		1-3	0.00	0.00

<b>Ground Cover</b>	
Type	% Cover
Plant	39.00
Litter	28.67
Bare	32.33
Rock	0.00
n	600



**Figure 77: Sands B Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

## Sands B



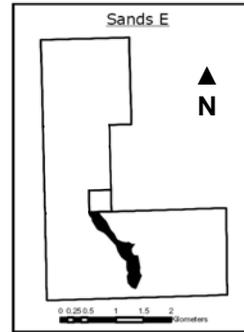
**Figure 78: Photographs of Sands B** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Sands E

Sands E stratum is located on southwest portion of the property. Sands E is southwest of Sand Creek and primarily occupies NPS land on section 25 T17S R46W.

This area has transitioned to a **Blue Grama, Sand Sagebrush Plant Community**, a state usually reached through continuous grazing. Most dominant grasses from the HCPC were not detected, including prairie sandreed, yellow Indiangrass, and switchgrass. Sand bluestem was detected below the HCPC level at 1.98% ( $\pm 0.66$ ). The current dominant grass species were detected at 12.10% ( $\pm 0.75$ ) blue grama, 8.40% ( $\pm 0.96$ ) sand dropseed, 4.94% ( $\pm 0.91$ ) hairy grama, 3.95% ( $\pm 0.85$ ) sixweeks fescue, and 3.70 ( $\pm 0.84$ ) red threeawn. The dominant forbs from the HCPC, Pacific peavine, purple prairie clover, dotted gayfeather, narrowleaf penstemon, and silky prairie clover, were not detected. The current dominant forb species were mostly annuals and were detected at a relative abundance of 11.85% ( $\pm 0.77$ ) woolly Indianwheat, 9.63% ( $\pm 0.92$ ) *Chenopodium* sp., 5.43% ( $\pm 0.93$ ) pepperpod mustard, and 4.94% ( $\pm 0.91$ ) scarlet globemallow. The dominant shrubs of the HCPC, western sandcherry and leadplant, were not detected. Sand sagebrush was the dominant shrub at 10.62% ( $\pm 0.87$ ), twice the abundance in the HCPC.

The Blue Grama, Sand Sagebrush Plant Community is stable but may lose many tallgrass species, important forbs, and shrubs. This composition can jeopardize the biotic integrity of the community. This state can also alter the nutrient/water/energy cycles and is an early stage of desertification. Although many of the dominant species of the HCPC are not found within the Sands E stratum, most of the species are found within the SCMNHs. Species not found on the SCMNHs include: yellow Indiangrass, Pacific peavine, narrowleaf penstemon, silky prairie clover, western sandcherry, and leadplant. However, these species may be present on neighboring lands.



## Sands E

**Site Type:** Rangeland

**Site Name:** Sands

**Site ID:** R067BY015CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 60

**Date:** June 2005

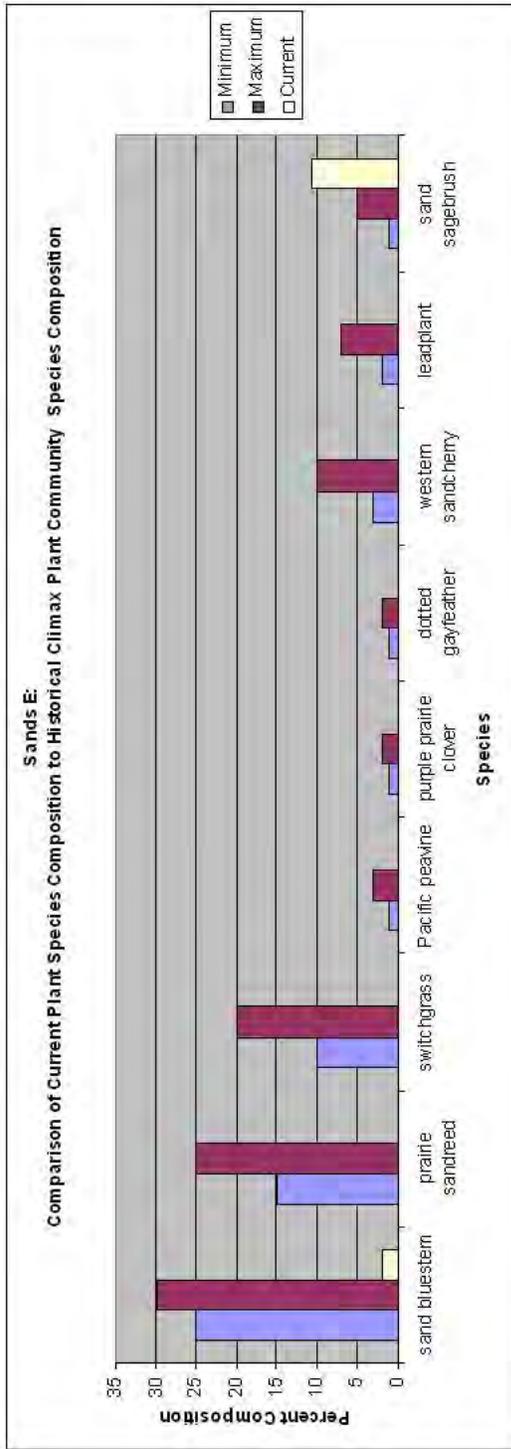
**Table 30: Sands E Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>				
sand bluestem	<i>Andropogon hallii</i>	25-30	1.98	0.66
prairie sandreed	<i>Calamovilfa longifolia</i>	15-25	0.00	0.00
switchgrass	<i>Panicum virgatum</i>	10-20	0.00	0.00
yellow Indiangrass	<i>Sorghastrum nutans</i>	5-10	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	3-7	0.74	0.42
blue grama	<i>Bouteloua gracilis</i>	1-5	12.10	0.75
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.00	0.00
blowout grass	<i>Redfieldia flexuosa</i>	1-2	0.00	0.00
hairy grama	<i>Bouteloua hirsuta</i>	1-2	4.94	0.91
Indian ricegrass	<i>Achnatherum hymenoides</i>	1-2	0.00	0.00
sand dropseed	<i>Sporobolus cryptandrus</i>	1-2	8.40	0.96
western wheatgrass	<i>Pascopyrum smithii</i>	1-2	0.00	0.00
sideoats grama	<i>Bouteloua curtipendula</i>	0-3	0.00	0.00
bottlebrush squirreltail	<i>Elymus elymoides</i>	0-1	0.00	0.00
prairie junegrass	<i>Koeleria macrantha</i>	0-1	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	0-1	3.70	0.84
sand paspalum	<i>Paspalum setaceum</i>	0-1	0.00	0.00
sandhill muhly	<i>Muhlenbergia pungens</i>	0-1	0.00	0.00
thickspike wheatgrass	<i>Elymus lanceolatus ssp. lanceolatus</i>	0-1	0.00	0.00
sand flatsedge	<i>Cyperus schweinitzii</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
thinstem flatsedge	<i>Cyperus lupulinus</i>	0-1	0.00	0.00
<b>Other native grasses</b>		0-3	4.20	1.10
buffalograss	<i>Buchloe dactyloides</i>		0.25	0.25
sixweeks fescue	<i>Vulpia octoflora</i>		3.95	0.85
<b>Forbs</b>				
Pacific peavine	<i>Lathyrus polymorphus</i>	1-3	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	1-2	0.00	0.00
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
silky prairie clover	<i>Dalea villosa</i>	1-2	0.00	0.00
annual buckwheat	<i>Eriogonum annuum</i>	0-1	0.00	0.00
bigtop dalea	<i>Dalea enneandra</i>	0-1	0.00	0.00
bush morning glory	<i>Ipomoea leptophylla</i>	0-1	0.00	0.00

death camas	<i>Zigadenus venenosus</i>	0-1	0.00	0.00
hairy goldenaster	<i>Heterotheca villosa</i>	0-1	0.00	0.00
heath aster	<i>Symphotrichum ericoides</i>	0-1	0.00	0.00
Hoods phlox	<i>Phlox hoodii</i>	0-1	0.00	0.00
lemon scurfpea	<i>Psoraleidum lanceolatum</i>	0-1	0.00	0.00
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.00	0.00
Nuttalls evolvulus	<i>Evolvulus nuttallianus</i>	0-1	0.00	0.00
othake	<i>Palafoxia sphacelata</i>	0-1	0.00	0.00
painted milkvetch	<i>Astragalus ceramicus var. filifolius</i>	0-1	0.00	0.00
pale evening primrose	<i>Oenothera albicaulis</i>	0-1	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	0-1	0.25	0.25
prairie larkspur	<i>Delphinium carolinianum</i>	0-1	0.00	0.00
prairie spiderwort	<i>Tradescantia occidentalis</i>	0-1	0.25	0.25
sand lily	<i>Leucocrinum montanum</i>	0-1	0.00	0.00
snowball sand verbena	<i>Abronia fragrans</i>	0-1	1.48	0.58
scarlet globemallow	<i>Sphaeralcea coccinea</i>	0-1	0.00	0.00
stiff sunflower	<i>Helianthus pauciflorus ssp. pauciflorus</i>	0-1	0.00	0.00
western ragweed	<i>Ambrosia psilostachya</i>	0-1	0.00	0.00
white prairie clover	<i>Dalea candida</i>	0-1	0.00	0.00
woolly Indianwheat	<i>Plantago patagonica</i>	0-1	11.85	0.77
<b>Other native forbs</b>		2-5	38.77	10.15
beggars tick	<i>Cryptantha circumscissa</i>		1.23	0.53
Chenopodium sp. #2	<i>Chenopodium sp.</i>		9.63	0.92
common sunflower	<i>Helianthus annuus</i>		0.74	0.42
conyza	<i>Conyza canadensis</i>		2.47	0.72
curlycup gumweed	<i>Grindelia squarrosa</i>		0.49	0.35
cutleaf daisy	<i>Erigeron compositus</i>		0.25	0.25
ironplant goldenweed	<i>Haplopappus spinulosus</i>		1.48	0.58
flaxflowered ipomopsis	<i>Ipomopsis longiflora</i>		0.25	0.25
Hopi tea greenthread	<i>Thelesperma megapotamicum</i>		0.74	0.42
narrowleaf fourclock	<i>Mirabilis linearis</i>		0.74	0.42
narrowleaf stoneseed	<i>Lithospermum incisum</i>		2.47	0.72
pepperpod mustard	<i>Lepidium densiflorum</i>		5.43	0.93
rush skeletonplant	<i>Lygodesmia juncea</i>		1.73	0.62
scarlet gaura	<i>Gaura coccinea</i>		1.48	0.58
scarlet globemallow	<i>Sphaeralcea coccinea</i>		4.94	0.91
slimflower scurfpea	<i>Psoraleidum tenuiflorum</i>		0.99	0.48
stickleaf mentzilia	<i>Mentzelia decapetala</i>		0.25	0.25
western fleabane	<i>Erigeron bellidiastrum</i>		3.46	0.82
<b>Non native forbs</b>		0	0.74	0.59
kochia	<i>Kochia scoparia</i>		0.49	0.35
Russian thistle	<i>Salsola iberica</i>		0.25	0.25
<b>Shrubs</b>				
western sandcherry	<i>Prunus pumila</i>	3-10	0.00	0.00
leadplant	<i>Amorpha canescens</i>	2-7	0.00	0.00
sand sagebrush	<i>Artemisia filifolia</i>	1-5	10.62	0.87
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.00	0.00
prairie rose	<i>Rosa arkansana</i>	0-1	0.00	0.00
purple pincushion	<i>Escobaria vivipara var. vivipara</i>	0-1	0.00	0.00
skunkbrush sumac	<i>Rhus trilobata</i>	0-1	0.00	0.00

spreading buckwheat	<i>Eriogonum effusum</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-3	0.00	0.00

<b>Ground Cover</b>	
Type	% Cover
Plant	41.39
Litter	35.28
Bare	23.33
Rock	0.00
n	360



**Figure 79: Sands E Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

### Sands E



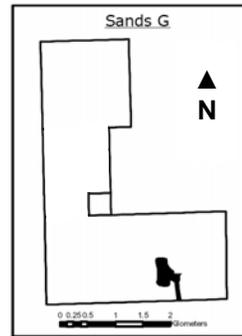
**Figure 80: Photographs of Sands E** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Sands G

The Sands G stratum is located on southeast portion of the property. Sands E is southwest of Sand Creek and occupies NPS land on section 30 T17S R45W.

This area is transitioning from a **Blue Grama, Sagebrush Plant Community** to a **Low Plant Density, Excessive Litter Plant Community**. Sands G shows a high abundance of sand sagebrush, sand dropseed, and annual forbs. It also has a high amount of litter cover (52.08% ( $\pm$  3.64)), half the amount of blue grama of other Sands strata, and many remnant species of the HCPC. Many dominant grasses from the HCPC were detected but at much lower levels than the HCPC, including sand bluestem, prairie sandreed, and switchgrass at 1.29% ( $\pm$  0.44), 4.03% ( $\pm$  0.67), and 0.65% ( $\pm$  0.32), respectively. The current dominant grass species were detected at 9.19% ( $\pm$  0.66) sand dropseed, 5.32% ( $\pm$  0.71) blue grama, 4.35% ( $\pm$  0.69) needleandthread, and 4.35% ( $\pm$  0.69) red threeawn. The dominant forbs from the HCPC, Pacific peavine, purple prairie clover, dotted gayfeather, narrowleaf penstemon, and silky prairie clover, were not detected. The current dominant forb species were mostly annuals and were detected at a relative abundance of 6.77% ( $\pm$  0.72) woolly Indianwheat, 5.00% ( $\pm$  0.71) western fleabane, 3.39% ( $\pm$  0.64) western ragweed, and 2.90% ( $\pm$  0.61) beggars tick. The dominant shrubs of the HCPC, western sandcherry and leadplant, were not detected. Sand sagebrush was the current dominant shrub at 11.45% ( $\pm$  0.46), twice the abundance in the HCPC. Brittle cactus was also detected at 0.16% ( $\pm$  0.16).

The Blue Grama, Sagebrush Plant Community is stable but may lose many tallgrass species, important forbs, and shrubs. This composition can jeopardize the biotic integrity of the community. This state can also alter the nutrient/water/energy cycles and is an early stage of desertification. High amounts of litter and low plant density is increasing in this area and can slow nutrient cycling and plant establishment. Although many of the dominant species of the HCPC are not found within the Sands G stratum, most of the species are found within the SCMNHs. Species not found on the SCMNHs include: yellow Indiangrass, Pacific peavine, narrowleaf penstemon, silky prairie clover, western sandcherry, and leadplant. However, these species may be present on neighboring lands.



## Sands G

**Site Type:** Rangeland

**Site Name:** Sands

**Site ID:** R067BY015CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 80

**Date:** June 2005

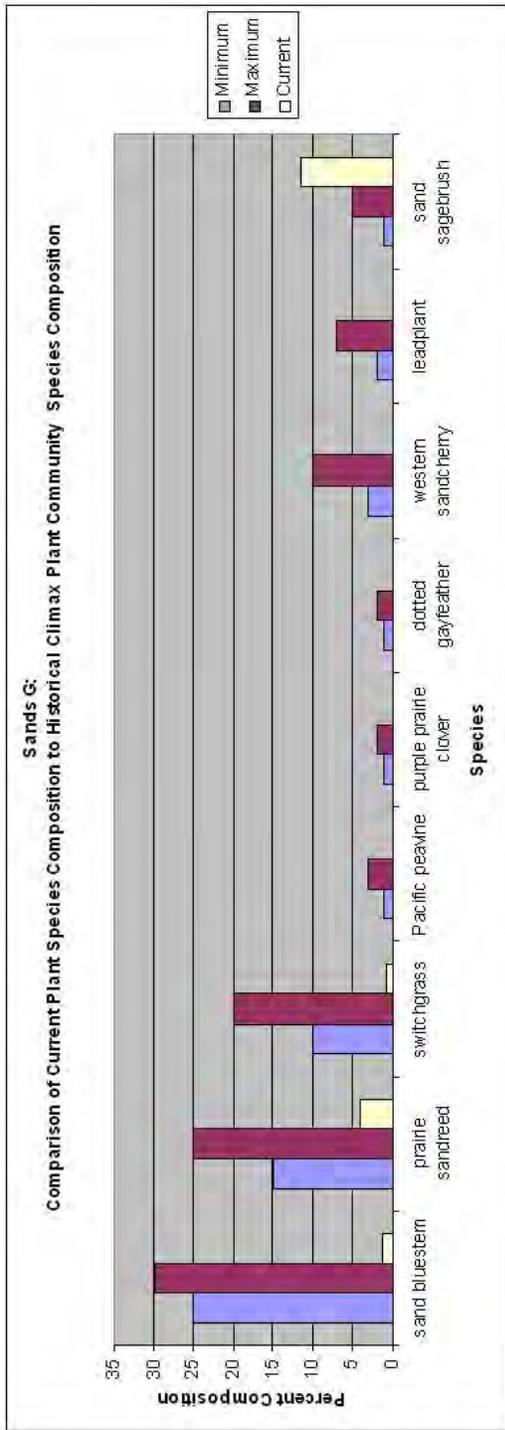
**Table 31: Sands G Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>				
sand bluestem	<i>Andropogon hallii</i>	25-30	1.29	0.44
prairie sandreed	<i>Calamovilfa longifolia</i>	15-25	4.03	0.67
switchgrass	<i>Panicum virgatum</i>	10-20	0.65	0.32
yellow Indiangrass	<i>Sorghastrum nutans</i>	5-10	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	3-7	4.35	0.69
blue grama	<i>Bouteloua gracilis</i>	1-5	5.32	0.71
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.48	0.28
blowout grass	<i>Redfieldia flexuosa</i>	1-2	1.13	0.41
hairy grama	<i>Bouteloua hirsuta</i>	1-2	0.00	0.00
Indian ricegrass	<i>Achnatherum hymenoides</i>	1-2	0.00	0.00
sand dropseed	<i>Sporobolus cryptandrus</i>	1-2	9.19	0.66
western wheatgrass	<i>Pascopyrum smithii</i>	1-2	3.55	0.65
sideoats grama	<i>Bouteloua curtipendula</i>	0-3	0.00	0.00
bottlebrush squirreltail	<i>Elymus elymoides</i>	0-1	0.32	0.23
prairie junegrass	<i>Koeleria macrantha</i>	0-1	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	0-1	4.35	0.69
sand paspalum	<i>Paspalum setaceum</i>	0-1	1.94	0.52
sandhill muhly	<i>Muhlenbergia pungens</i>	0-1	0.00	0.00
thickspike wheatgrass	<i>Elymus lanceolatus</i> ssp. <i>lanceolatus</i>	0-1	0.00	0.00
sand flatsedge	<i>Cyperus schweinitzii</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops</i> ssp. <i>heliophila</i>	1-2	0.48	0.28
thinstem flatsedge	<i>Cyperus lupulinus</i>	0-1	0.00	0.00
<b>Other native grasses and grass likes</b>		0-3	4.68	2.09
alkali sacaton	<i>Sporobolus airoides</i>		0.32	0.23
inland saltgrass	<i>Distichlis spicata</i>		0.65	0.32
prairie threeawn	<i>Aristida oligantha</i>		0.97	0.38
sand lovegrass	<i>Eragrostis trichodes</i>		1.77	0.50
sedge	<i>Carex</i> sp.		0.16	0.16
sixweeks fescue	<i>Vulpia octoflora</i>		0.32	0.23
tall dropseed	<i>Sporobolus compositus</i>		0.48	0.28
<b>Forbs</b>				
Pacific peavine	<i>Lathyrus polymorphus</i>	1-3	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	1-2	0.00	0.00

dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
silky prairie clover	<i>Dalea villosa</i>	1-2	0.00	0.00
annual buckwheat	<i>Eriogonum annuum</i>	0-1	0.00	0.00
bigtop dalea	<i>Dalea enneandra</i>	0-1	0.81	0.35
bush morning glory	<i>Ipomoea leptophylla</i>	0-1	0.00	0.00
death camas	<i>Zigadenus venenosus</i>	0-1	0.00	0.00
hairy goldenaster	<i>Heterotheca villosa</i>	0-1	0.00	0.00
heath aster	<i>Symphotrichum ericoides</i>	0-1	1.61	0.48
Hoods phlox	<i>Phlox hoodii</i>	0-1	0.00	0.00
lemon scurfpea	<i>Psoralegium lanceolatum</i>	0-1	0.65	0.32
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.48	0.28
Nuttalls evolulus	<i>Evolvulus nuttallianus</i>	0-1	1.77	0.50
othake	<i>Palafoxia sphacelata</i>	0-1	0.00	0.00
painted milkvetch	<i>Astragalus ceramicus var. filifolius</i>	0-1	0.00	0.00
pale evening primrose	<i>Oenothera albicaulis</i>	0-1	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	0-1	0.00	0.00
prairie larkspur	<i>Delphinium carolinianum</i>	0-1	0.00	0.00
prairie spiderwort	<i>Tradescantia occidentalis</i>	0-1	0.16	0.16
sand lily	<i>Leucocrinum montanum</i>	0-1	0.00	0.00
snowball sand verbena	<i>Abronia fragrans</i>	0-1	0.65	0.32
scarlet globemallow	<i>Sphaeralcea coccinea</i>	0-1	0.00	0.00
stiff sunflower	<i>Helianthus pauciflorus ssp. pauciflorus</i>	0-1	0.00	0.00
western ragweed	<i>Ambrosia psilostachya</i>	0-1	3.39	0.64
white prairie clover	<i>Dalea candida</i>	0-1	0.00	0.00
woolly Indianwheat	<i>Plantago patagonica</i>	0-1	6.77	0.72
<b>Other native forbs</b>		2-5	27.26	8.11
beggars tick	<i>Cryptantha circumscissa</i>		2.90	0.61
Chenopodium sp. #1	<i>Chenopodium sp.</i>		2.42	0.57
Chenopodium sp. #2	<i>Chenopodium sp.</i>		1.13	0.41
common sunflower	<i>Helianthus annuus</i>		1.45	0.46
conyza	<i>Conyza canadensis</i>		1.94	0.52
ironplant goldenweed	<i>Haplopappus spinulosus</i>		0.97	0.38
evening-primrose	<i>Oenothera spp.</i>		0.16	0.16
flaxflowered ipomopsis	<i>Ipomopsis longiflora</i>		0.16	0.16
hairy goldenaster	<i>Heterotheca villosa</i>		0.16	0.16
Hopi tea greenthread	<i>Thelesperma megapotamicum</i>		0.32	0.23
Indianhemp dogbane	<i>Apocynum cannabinum</i>		0.65	0.32
narrowleaf fourclock	<i>Mirabilis linearis</i>		0.32	0.23
narrowleaf stoneseed	<i>Lithospermum incisum</i>		1.13	0.41
pepperpod mustard	<i>Lepidium densiflorum</i>		3.06	0.62
prairie groundcherry	<i>Physalis pumila</i>		0.48	0.28
rush skeletonplant	<i>Lygodesmia juncea</i>		0.32	0.23
scarlet gaura	<i>Gaura coccinea</i>		0.48	0.28
stickleaf mentzilia	<i>Mentzelia decapetala</i>		2.58	0.58
velvet gaura	<i>Gaura parviflora</i>		0.97	0.38
wavyleaf thistle	<i>Cirsium undulatum</i>		0.16	0.16
western fleabane	<i>Erigeron bellidiastrum</i>		5.00	0.71
winecup	<i>Callirhoe involucrata</i>		0.48	0.28

<b>Non native forbs</b>		0	3.06	1.12
kochia	<i>Kochia scoparia</i>		1.13	0.41
redroot pigweed	<i>Amaranthus retroflexus</i>		0.32	0.23
Russian thistle	<i>Salsola iberica</i>		1.61	0.48
<b>Shrubs</b>				
western sandcherry	<i>Prunus pumila</i>	3-10	0.00	0.00
leadplant	<i>Amorpha canescens</i>	2-7	0.00	0.00
sand sagebrush	<i>Artemisia filifolia</i>	1-5	11.45	0.46
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.00	0.00
prairie rose	<i>Rosa arkansana</i>	0-1	0.00	0.00
purple pincushion	<i>Escobaria vivipara var. vivipara</i>	0-1	0.00	0.00
skunkbrush sumac	<i>Rhus trilobata</i>	0-1	0.00	0.00
spreading buckwheat	<i>Eriogonum effusum</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-3	0.16	0.16
brittle cactus	<i>Opuntia fragilis</i>		0.16	0.16

<b>Ground Cover</b>	
Type	% Cover
Plant	26.04
Litter	50.42
Bare	23.54
Rock	0.00
n	480



**Figure 81: Sands G Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

## Sands G



**Figure 82: Photographs of Sands G** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.



## **Sandy:**

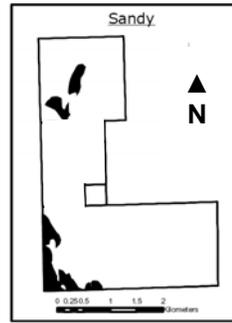
**Site Type:** Rangeland

**Site Name:** Sandy

**Site ID:** R067BY024CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**Soil Classification:** Ustic Torriothents\*



### ***Physiographic Features***

This site occurs on level to hilly uplands and plains. There is no significant flooding or ponding. This site has a runoff class of very low to medium.

### ***Soil Features***

The soils of this site are very deep and well drained and are moderately rapid to moderately permeable. These soils occur on plains, hills, ridges, alluvial fans, toe slopes, foot slopes and terraces. The available water capacity is typically low or moderate. The pH ranges from neutral to moderately alkaline. The soil surface layer ranges from 3 to 10 inches thick and is typically fine sandy loam, sandy loam, or loamy sand. The soil moisture regime is typically aridic ustic with some ustic aridic in the drier areas. The soil temperature regime is mesic. These soils are susceptible to wind erosion.

The Historic Climax Plant Community (HCPC) should portray slight to no evidence of rills. Water flow paths, if present, are broken, irregular in appearance or discontinuous with numerous debris dams or vegetative barriers. Wind scoured areas and pedestaled plants may exist in areas but should be minor. The soil surface is stable and intact. Sub-surface soil layers are non-restrictive to water movement and root penetration.

Major soil series correlated to this Ecological Site include: Ascalon, Bijou, Bresser, Fort Collins (sandy loam), Gilcrest, Haverson (sandy loam), Haxtun, Julesburg, Manter, Nunn (sandy loam), Olneft, Otero, Paoli, Platner (sandy loam), Stoneham (sandy loam), Sundance, Terry, Truckton and Vona.

**Parent Material Kind:** eolian deposits

**Parent Material Origin:** mixed

**Surface Texture:** fine sandy loam, sandy loam and loamy sand

**Surface Texture Modifier:** none

**Subsurface Texture Group:** sandy

**Surface Fragments < 3" (% Cover):** 0

**Surface Fragments > 3" (%Cover):** 0

**SubSurface Fragments < 3" (% Volume):** 0

**Subsurface Fragments > 3" (% Volume):** 0

**Drainage Class:** well - somewhat excessive

**Permeability Class:** moderately - moderately rapid

**Depth (inches):** 80

**Electrical Conductivity (mmhos/cm)\*\*:** 0.00 - 2.00

**Sodium Absorption Ratio\*\*:** 0

**Soil Reaction (1:1 Water)\*\*:** 6.6 - 8.4

**Available Water Capacity (inches)\*\*:** 3 - 9

**Calcium Carbonate Equivalent (percent)\*\*:** 0 - 5

\* A complete soil classification table for Kiowa County is located in Appendix E.

\*\*These attributes represent 0-40 inches in depth or to the first restrictive layer.

**Historic Climax Plant Community:**

The historic climax plant community (description follows) has been determined by study of rangeland relic areas, areas protected from excessive disturbance, seasonal use pastures, short durational/time controlled grazing and historical accounts.

The plant community described should not necessarily be thought of as the "Desired Plant Community". According to the USDA NRCS National Range and Pasture Handbook, Desired Plant Communities will be determined by the decision-makers and will meet minimum quality criteria established by the NRCS. The main purpose for, including any description of a plant community here is to capture the current knowledge and experience at the time.

**Blue Grama, Prairie Sandreed, Sand Bluestem Plant Community**

This is the interpretive plant community and is considered to be the Historic Climax Plant Community (HCPC). This plant community evolved with grazing by large herbivores, is well suited for grazing by domestic livestock, and can be found on areas that are properly managed with grazing that allows adequate recovery periods following each grazing occurrence during the growing season.

The potential vegetation is about 70-85% grasses and grass-like plants, 10-15% forbs and 5-15% woody plants. The dominant tall warm season grasses are prairie sandreed, sand bluestem and switchgrass. Blue grama dominates the understory. Important cool season grasses and grass-likes are needleandthread and sun sedge. Key forbs and shrubs are American vetch, pacific peavine, purple prairie clover, western sandcherry and leadplant.

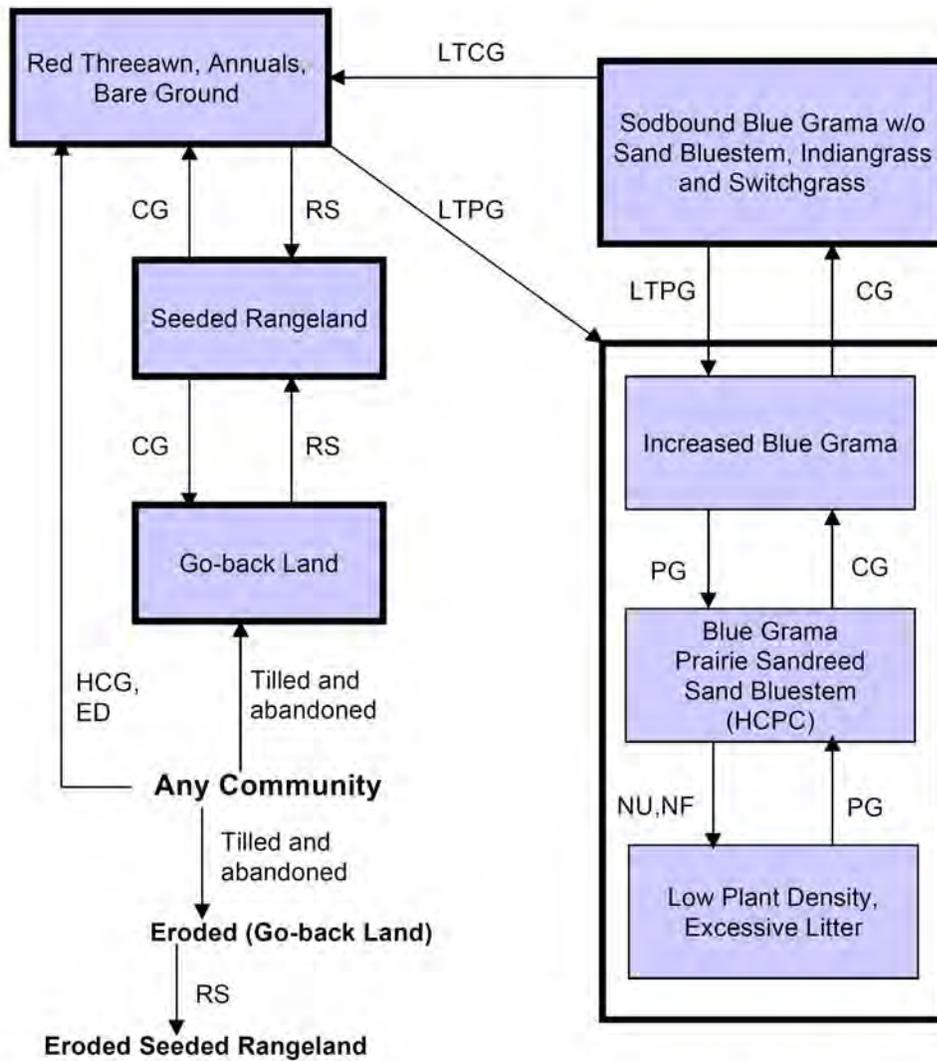
This plant community is well adapted to the Northern Great Plains climatic conditions and is relatively resistant to many disturbances except prolonged continuous grazing, sodbusting, urban and other development. The diversity in plant species allows for high drought tolerance. Plant litter is properly distributed with very little movement off-site and natural plant mortality is very low. This is a sustainable plant community in terms of soil stability, watershed function and biologic integrity.

Production in this community can vary from 800 to 2200 pounds of air-dry vegetation per acre per year depending on weather conditions and averages 1650 pounds.

**Plant Communities and Transitional Pathways**

Continuous grazing without adequate recovery opportunities following each grazing event during the growing season will cause blue grama to increase and eventually form a sodbound condition. Major warm season grasses such as sand bluestem, yellow Indiangrass and switchgrass will decrease in frequency and production. Key forbs and shrubs such as American vetch, purple prairie clover and western sandcherry will decrease also. Red threeawn, annuals and bare ground will increase with long term continuous grazing, heavy continuous grazing or excessive defoliation. Years of non-use (rest) or lack of fire will cause litter to accumulate and reduce plant density.

The following diagram illustrates the common plant communities that can occur on the site and the transition pathways (arrows) among communities. Bold lines surrounding each plant community or communities represent ecological thresholds (USDA, NRCS 2004). The ecological processes are discussed in more detail in the Ecological Site Description from the NRCS Field Office Technical Guide.



**CG** - continuous grazing without adequate recovery opportunity, **ED** - excessive defoliation, **HCG** - heavy continuous grazing, **HCPC** - Historic Climax Plant Community, **LTCG** - long term continuous grazing (>25 yrs), **LTPG** - long term prescribed grazing (>40 yrs), **PG** - prescribed grazing with adequate recovery period, **NF** - no fire, **NU** - non-use, **RS** - range seeding

**Figure 83: Sandy State and Transition Model** - Diagram of the Sandy Ecological Site MRLA 67B community states and transitions (USDA, NRCS 2004).

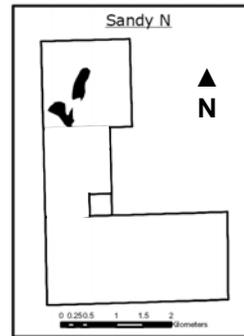
## Sandy Early Seral

### Sandy N

The Sandy N stratum is located on north portion of the property. Sandy N is northeast of Sand Creek and occupies NPS land on section 13 T17S R46W.

This area has transitioned to a **Sodbound Blue Grama without Sand Bluestem, Indiangrass and Switchgrass Plant Community**, a state usually reached through long term continuous grazing. Most dominant grasses from the HCPC were not detected, including prairie sandreed, sand bluestem, needleandthread, and switchgrass. The other dominant grass, blue grama, was detected below the HCPC level at 12.63% ( $\pm 1.57$ ). The current dominant grass species were detected at a relative abundance of 17.68% ( $\pm 1.07$ ) sand dropseed, 12.63% ( $\pm 1.57$ ) blue grama, 7.58% ( $\pm 1.57$ ) red threeawn, and 4.55% ( $\pm 1.35$ ) buffalograss. Most dominant forbs from the HCPC were not detected, including American vetch, dotted gayfeather, narrowleaf penstemon, Pacific peavine, prairie spiderwort, purple prairie clover, upright prairie coneflower, and cutleaf evening-primrose. The other dominant forb, scarlet globemallow, was detected at 17.68% ( $\pm 1.07$ ), times more than the HCPC level. The current dominant forb species were detected at a relative abundance of 17.68% ( $\pm 1.07$ ) scarlet globemallow, 12.63% ( $\pm 1.57$ ) Russian thistle, 6.06% ( $\pm 1.48$ ) slimflower scurfpea, and 5.05% ( $\pm 1.40$ ) yellow sweetclover. The dominant shrubs of the HCPC, western sandcherry, leadplant, and spreading buckwheat were not detected. Sand sagebrush was the dominant shrub at 7.07% ( $\pm 1.54$ ), over twice the abundance in the HCPC. Green rabbitbrush was detected at a suitable amount for the HCPC at 0.51% ( $\pm 0.51$ ).

Sodbound Blue Grama without Sand Bluestem, Indiangrass and Switchgrass Plant Community is stable in terms of soil but has lost much production and biological diversity. This composition can jeopardize the biotic integrity of the community altering the nutrient/water/energy cycles and it is an advanced stage of desertification. Although many of the dominant species of the HCPC are not found within the Sandy N stratum, most of the species are found within the SCMNHs. Species not found on the SCMNHs include: yellow Indiangrass, American vetch, narrowleaf penstemon, Pacific peavine, western sandcherry, fourwing saltbush, spreading buckwheat. However, these species may be present on neighboring lands.



## Sandy N

**Site Type:** Rangeland

**Site Name:** Sandy

**Site ID:** R067BY024CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 40

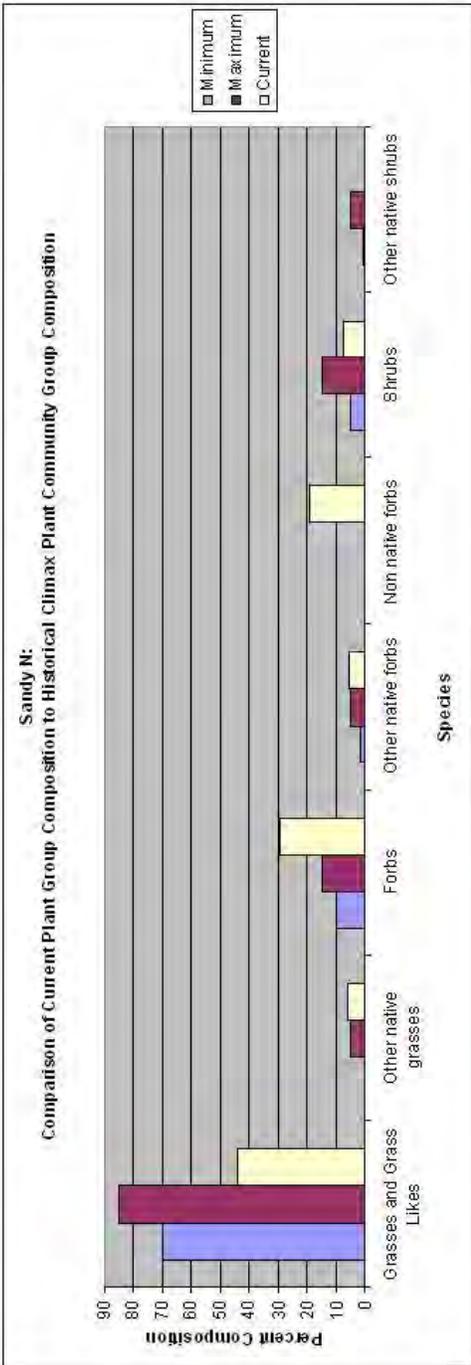
**Date:** June 2005

**Table 32: Sandy N Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

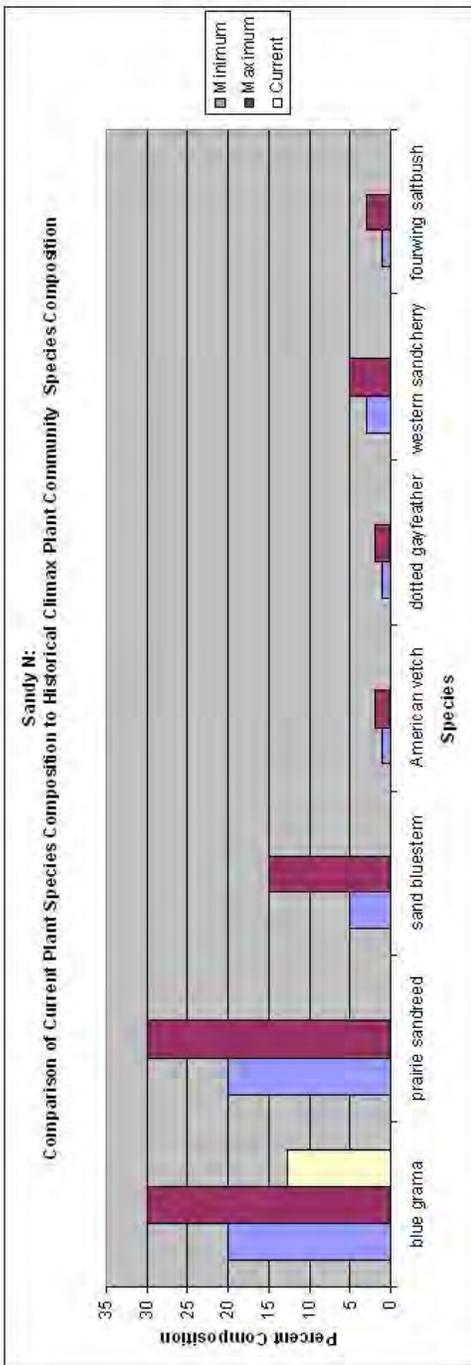
Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>		70-85	43.94	6.40
blue grama	<i>Bouteloua gracilis</i>	20-30	12.63	1.57
prairie sandreed	<i>Calamovilfa longifolia</i>	20-30	0.00	0.00
sand bluestem	<i>Andropogon hallii</i>	5-15	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	5-10	0.00	0.00
switchgrass	<i>Panicum virgatum</i>	5-10	0.00	0.00
western wheatgrass	<i>Pascopyrum smithii</i>	1-7	0.00	0.00
yellow Indiangrass	<i>Sorghastrum nutans</i>	1-5	0.00	0.00
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.00	0.00
sideoats grama	<i>Bouteloua curtipendula</i>	1-5	0.00	0.00
thickspike wheatgrass	<i>Elymus lanceolatus ssp. lanceolatus</i>	0-5	0.00	0.00
prairie junegrass	<i>Koeleria macrantha</i>	1-3	0.00	0.00
sand dropseed	<i>Sporobolus cryptandrus</i>	1-3	17.68	1.07
Indian ricegrass	<i>Achnatherum hymenoides</i>	1-2	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	0-1	7.58	1.57
sand paspalum	<i>Paspalum setaceum</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-5	0.00	0.00
<b>Other native grasses</b>		0-5	6.06	2.20
bottlebrush squirreltail	<i>Elymus elymoides</i>		1.52	0.85
buffalograss	<i>Buchloe dactyloides</i>		4.55	1.35
<b>Forbs</b>		10-15	29.29	6.89
American vetch	<i>Vicia americana</i>	1-2	0.00	0.00
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
Pacific peavine	<i>Lathyrus polymorphus</i>	1-2	0.00	0.00
prairie spiderwort	<i>Tradescantia occidentalis</i>	1-2	0.00	0.00
purple prairie clover	<i>Dalea purpurea var. purpurea</i>	1-2	0.00	0.00
scarlet globemallow	<i>Sphaeralcea coccinea</i>	1-2	17.68	1.07
upright prairie coneflower	<i>Ratibida columnifera</i>	1-2	0.00	0.00
cutleaf evening-primrose	<i>Oenothera coronopifolia</i>	1-2	0.00	0.00
hairy goldenaster	<i>Heterotheca villosa</i>	0-1	0.00	0.00
heath aster	<i>Symphotrichum ericoides var. ericoides</i>	0-1	0.00	0.00
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.00	0.00
Nuttalls evolvulus	<i>Evolvulus nuttallianus</i>	0-1	0.00	0.00
rush skeletonplant	<i>Lygodesmia juncea</i>	0-1	0.00	0.00

silverleaf scurfpea	<i>Psoralea argophylla</i>	0-1	0.00	0.00
slimflower scurfpea	<i>Psoralidium tenuiflorum</i>	0-1	6.06	1.48
stickleaf mentzilia	<i>Mentzelia decapetala</i>	0-1	0.00	0.00
Texas croton	<i>Croton texensis</i>	0-1	0.00	0.00
western ragweed	<i>Ambrosia psilostachya</i>	0-1	0.00	0.00
woolly locoweed	<i>Astragalus mollissimus</i>	0-1	0.00	0.00
wormwood	<i>Artemisia dracunculus</i>	0-1	0.00	0.00
<b>Other native forbs</b>		2-5	5.56	4.34
bush morning glory	<i>Ipomoea leptophylla</i>		0.51	0.51
conyza	<i>Conyza canadensis</i>		1.01	0.71
ironplant goldenweed	<i>Haplopappus spinulosus</i>		1.01	0.71
flatspine stickseed	<i>Lappula echinata var. occidentalis</i>		1.01	0.71
narrowleaf stoneseed	<i>Lithospermum incisum</i>		0.51	0.51
scarlet gaura	<i>Gaura coccinea</i>		0.51	0.51
stiff flax	<i>Linum rigidum</i>		1.01	0.71
<b>Non native forbs</b>		0	19.19	3.82
kochia	<i>Kochia scoparia</i>		1.52	0.85
Russian thistle	<i>Salsola iberica</i>		12.63	1.57
yellow sweetclover	<i>Melilotus officinalis</i>		5.05	1.40
<b>Shrubs</b>		5-15	7.58	2.05
western sandcherry	<i>Prunus pumila</i>	3-5	0.00	0.00
fourwing saltbush	<i>Atriplex canescens</i>	1-3	0.00	0.00
spreading buckwheat	<i>Eriogonum effusum</i>	1-2	0.00	0.00
sand sagebrush	<i>Artemisia filifolia</i>	0-2	7.07	1.54
broom snakeweed	<i>Gutierrezia sarothrae</i>	0-1	0.00	0.00
fringed sagebrush	<i>Artemisia frigida</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.00	0.00
purple pincushion	<i>Escobaria vivipara var. vivipara</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.00	0.00
<b>Other shrubs</b>		1-5	0.51	0.51
green rabbitbrush	<i>Chrysothamnus visidiflorus</i>		0.51	0.51

Ground Cover	
Type	% Cover
Plant	37.08
Litter	46.67
Bare	16.25
Rock	0.00
n	240



**Figure 85: Sandy N Plant Group Composition** - This graph depicts the current plant group composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that plant group on the Ecological Site. The yellow is the current group composition.



**Figure 84: Sandy N Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

## Sandy N



**Figure 86: Photographs of Sandy N** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

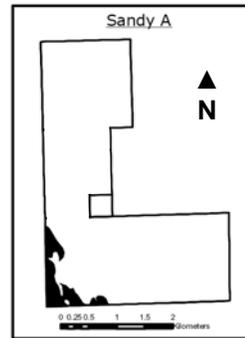
## Sandy Early-Mid Seral

### Sandy A

The Sandy A stratum is located on southwest portion of the property. Sandy A is southwest of Sand Creek and occupies NPS land on section 25 T17S R46W.

This area is transitioning to a **Low Plant Density, Excessive Litter Plant Community**, a state that usually occurs when grazing is removed for long periods of time or in the absence of fire. Sandy A may appear to be a lower seral stage but this is most likely the effect of drought. Most dominant grasses from the HCPC were not detected, including prairie sandreed, sand bluestem, needleandthread, and switchgrass. The other dominant grass, blue grama, was detected below the HCPC level at 10.39% ( $\pm 0.85$ ). The current dominant grass species were detected at 11.84% ( $\pm 0.73$ ) sand dropseed, 10.39% ( $\pm 0.85$ ) blue grama, 2.66% ( $\pm 0.73$ ) red threeawn, and 2.66% ( $\pm 0.73$ ) sixweeks fescue. Most dominant forbs from the HCPC were not detected, including American vetch, dotted gayfeather, narrowleaf penstemon, Pacific peavine, prairie spiderwort, purple prairie clover, upright prairie coneflower, and cutleaf evening-primrose. The other dominant forb, scarlet globemallow, was detected above the HCPC level at 3.36% ( $\pm 0.82$ ). The current dominant forb species were mostly annuals and were detected at a relative abundance of 6.28% ( $\pm 0.93$ ) pepperpod mustard, 5.80% ( $\pm 0.92$ ) beggars tick, 5.31% ( $\pm 0.91$ ) woolly Indianwheat, and 5.07% ( $\pm 0.90$ ) western ragweed. The dominant shrubs of the HCPC, western sandcherry, leadplant, and spreading buckwheat, were not detected. Sand sagebrush was the dominant shrub at 8.70% ( $\pm 0.92$ ), over twice the abundance in the HCPC. Plains pricklypear was detected at a suitable amount for the HCPC at 0.24% ( $\pm 0.24$ ).

Much of the nutrients in the Low Plant Density, Excessive Litter Plant Community are tied up in excessive litter and this has slowed nutrient cycling. Above ground litter also limits sunlight from reaching plant crowns and reduces seed germination and establishment. This plant community has the ability to change rapidly. Although many of the dominant species of the HCPC are not found within the Sandy A stratum, most of the species are found within the SCMNHs. Species not found on the SCMNHs include: yellow Indiagrass, American vetch, narrowleaf penstemon, Pacific peavine, western sandcherry, fourwing saltbush, spreading buckwheat. However, these species may be present on neighboring lands.



## Sandy A

**Site Type:** Rangeland

**Site Name:** Sandy

**Site ID:** R067BY024CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 80

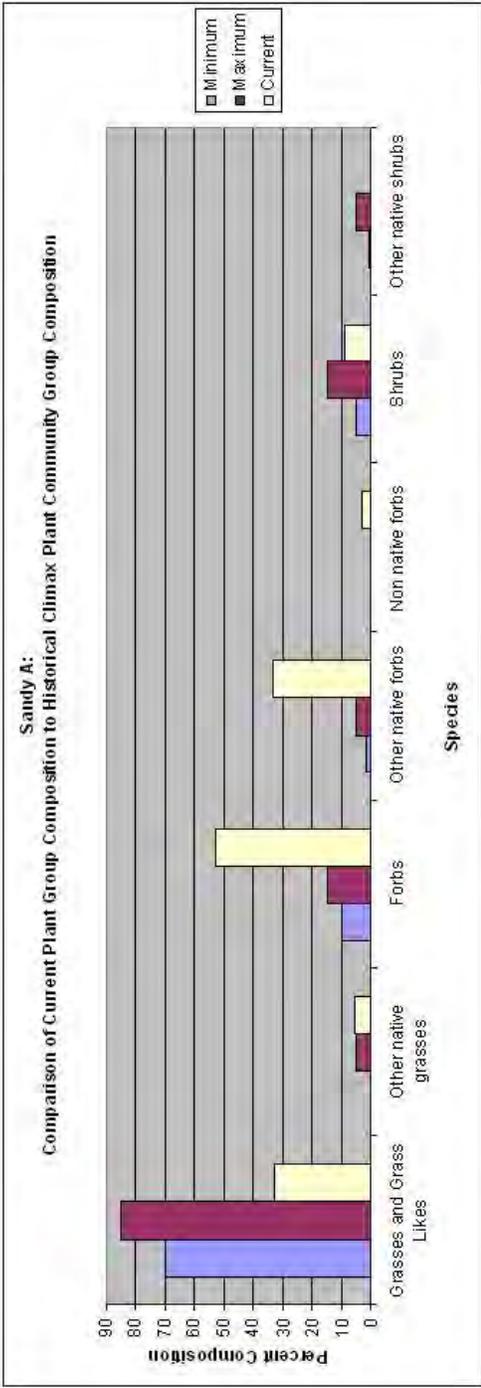
**Date:** June 2005

**Table 33: Sandy A Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

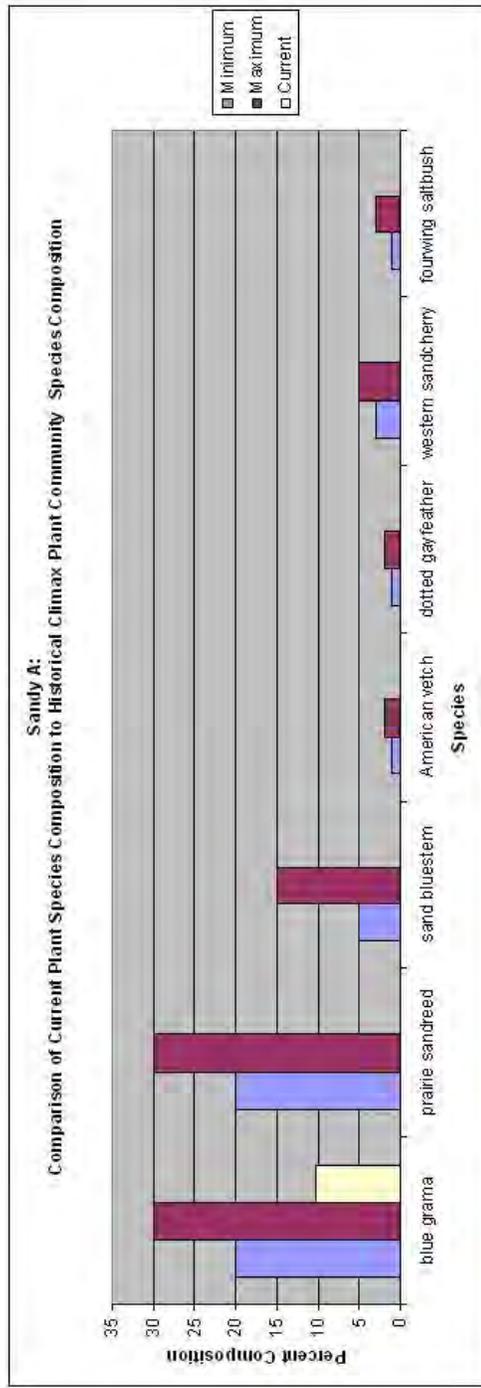
Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>		<b>70-85</b>	<b>32.61</b>	<b>5.13</b>
blue grama	<i>Bouteloua gracilis</i>	20-30	10.39	0.85
prairie sandreed	<i>Calamovilfa longifolia</i>	20-30	0.00	0.00
sand bluestem	<i>Andropogon hallii</i>	5-15	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	5-10	0.00	0.00
switchgrass	<i>Panicum virgatum</i>	5-10	0.00	0.00
western wheatgrass	<i>Pascopyrum smithii</i>	1-7	0.00	0.00
yellow Indiangrass	<i>Sorghastrum nutans</i>	1-5	0.00	0.00
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.00	0.00
sideoats grama	<i>Bouteloua curtipendula</i>	1-5	1.93	0.64
thickspike wheatgrass	<i>Elymus lanceolatus ssp. lanceolatus</i>	0-5	0.00	0.00
prairie junegrass	<i>Koeleria macrantha</i>	1-3	0.00	0.00
sand dropseed	<i>Sporobolus cryptandrus</i>	1-3	11.84	0.73
Indian ricegrass	<i>Achnatherum hymenoides</i>	1-2	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	0-1	2.66	0.73
sand paspalum	<i>Paspalum setaceum</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-5	0.00	0.00
<b>Other native grasses</b>		<b>0-5</b>	<b>5.80</b>	<b>2.18</b>
bottlebrush squirreltail	<i>Elymus elymoides</i>		1.45	0.57
buffalograss	<i>Buchloe dactyloides</i>		0.97	0.47
inland saltgrass	<i>Distichlis spicata</i>		0.72	0.41
sixweeks fescue	<i>Vulpia octoflora</i>		2.66	0.73
<b>Forbs</b>		<b>10-15</b>	<b>52.86</b>	<b>13.98</b>
American vetch	<i>Vicia americana</i>	1-2	0.00	0.00
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
Pacific peavine	<i>Lathyrus polymorphus</i>	1-2	0.00	0.00
prairie spiderwort	<i>Tradescantia occidentalis</i>	1-2	0.00	0.00
purple prairie clover	<i>Dalea purpurea var. purpurea</i>	1-2	0.00	0.00
scarlet globemallow	<i>Sphaeralcea coccinea</i>	1-2	3.62	0.82
upright prairie coneflower	<i>Ratibida columnifera</i>	1-2	0.00	0.00
cutleaf evening-primrose	<i>Oenothera coronopifolia</i>	1-2	0.00	0.00
hairy goldenaster	<i>Heterotheca villosa</i>	0-1	0.00	0.00
heath aster	<i>Symphotrichum ericoides var. ericoides</i>	0-1	1.69	0.61
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.00	0.00

Nuttalls evolvulus	<i>Evolvulus nuttallianus</i>	0-1	1.45	0.57
rush skeletonplant	<i>Lygodesmia juncea</i>	0-1	0.48	0.34
silverleaf scurfpea	<i>Psoralea argophylla</i>	0-1	0.00	0.00
slimflower scurfpea	<i>Psoralidium tenuiflorum</i>	0-1	2.90	0.75
stickleaf mentzilia	<i>Mentzelia decapetala</i>	0-1	0.00	0.00
Texas croton	<i>Croton texensis</i>	0-1	1.21	0.52
western ragweed	<i>Ambrosia psilostachya</i>	0-1	5.07	0.90
woolly locoweed	<i>Astragalus mollissimus</i>	0-1	0.00	0.00
wormwood	<i>Artemisia dracunculus</i>	0-1	0.00	0.00
<b>Other native forbs</b>		2-5	33.05	8.34
annual buckwheat	<i>Eriogonum annuum</i>		5.31	0.91
Aster sp.	<i>Aster sp.</i>		0.48	0.34
beggars tick	<i>Cryptantha circumscissa</i>		5.80	0.92
bush morning glory	<i>Ipomoea leptophylla</i>		0.48	0.34
common sunflower	<i>Helianthus annuus</i>		4.11	0.85
conyza	<i>Conyza canadensis</i>		3.14	0.78
ironplant goldenweed	<i>Haplopappus spinulosus</i>		0.48	0.34
narrowleaf stoneseed	<i>Lithospermum incisum</i>		0.24	0.24
pepperpod mustard	<i>Lepidium densiflorum</i>		6.28	0.93
prairie groundcherry	<i>Physalis pumila</i>		0.72	0.41
scarlet gaura	<i>Gaura coccinea</i>		0.72	0.41
western fleabane	<i>Erigeron bellidiastrum</i>		1.45	0.57
white prairie clover	<i>Dalea candida</i>		0.24	0.24
woolly Indianwheat	<i>Plantago patagonica</i>		3.59	1.05
<b>Non native forbs</b>		0	3.38	1.14
kochia	<i>Kochia scoparia</i>		0.72	0.41
Russian thistle	<i>Salsola iberica</i>		2.66	0.73
<b>Unidentified forbs</b>				
UF20			3.62	0.82
UF99	<i>Brassicaceae</i>		0.24	0.24
<b>Shrubs</b>		5-15	8.94	1.17
western sandcherry	<i>Prunus pumila</i>	3-5	0.00	0.00
fourwing saltbush	<i>Atriplex canescens</i>	1-3	0.00	0.00
spreading buckwheat	<i>Eriogonum effusum</i>	1-2	0.00	0.00
sand sagebrush	<i>Artemisia filifolia</i>	0-2	8.70	0.92
broom snakeweed	<i>Gutierrezia sarothrae</i>	0-1	0.00	0.00
fringed sagebrush	<i>Artemisia frigida</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.24	0.24
purple pincushion	<i>Escobaria vivipara var. vivipara</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-5	0.00	0.00

<b>Ground Cover</b>	
Type	% Cover
Plant	36.11
Litter	45.56
Bare	18.33
Rock	0.00



**Figure 88: Sandy A Plant Group Composition** - This graph depicts the current plant group composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that plant group on the Ecological Site. The yellow is the current group composition.



**Figure 87: Sandy A Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

## Sandy A



**Figure 89: Photographs of Sandy A** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.



## Sandy Bottomland:

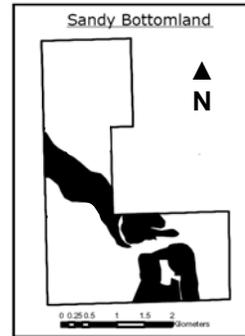
**Site Type:** Rangeland

**Site Name:** Sandy Bottomland

**Site ID:** R067BY031CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**Soil Classification:** Ustic Torriothents\*



### **Physiographic Features**

This site occupies the first flood-plain step between the streambed and higher sandy terraces. It may also be found in a few sandy valleys and drainage ways where there is some effect from extra moisture. Topography is nearly level to gently sloping. Surface may be smooth or exhibit minor undulations. Flooding is rare to frequent with a duration of very brief to brief. There is no significant ponding and the runoff class is negligible to very low.

### **Soil Features**

The soils of this site are very deep, somewhat excessive to well drained, and moderately rapid to rapidly permeable. These soils occur on flood plains and flood-plain steps. They formed in alluvium derived from mixed sources. They typically are frequently flooded. Some soils have gravel at depths of 10 to 60 inches. The available water capacity is typically low to moderate. The soil surface layer is typically 3 to 8 inches thick and is loamy sand, sandy loam, and fine sandy loam. The soil moisture regime is ustic aridic. The soil temperature regime is mesic. The Historic Climax Plant Community (HCPC) should exhibit slight to no evidence of rills. Water flow paths, if any, are broken, irregular in appearance or discontinuous with numerous debris dams or vegetative barriers. Wind scoured areas are inherent to this site and some soil movement may be noticeable on various landscape positions. Minor plant pedestalling may occur in these areas. Overall, the soil surface is stable and intact. Sub-surface soil layers are non-restrictive to water movement and root penetration.

Major soil series correlated to this Ecological Site include: Bankard and Glenberg

**Parent Material Kind:** alluvium

**Parent Material Origin:** mixed

**Surface Texture:** loamy sand, sandy loam, fine sandy loam

**Surface Texture Modifier:** none

**Subsurface Texture Group:** sandy

**Surface Fragments < 3" (% Cover):** 0

**Surface Fragments > 3" (%Cover):** 0

**SubSurface Fragments < 3" (% Volume):** 0

**Subsurface Fragments > 3" (% Volume):** 25

**Drainage Class:** well - somewhat excessive

**Permeability Class:** moderately rapid - rapid

**Depth (inches):** 80

**Electrical Conductivity (mmhos/cm)\*\*:** 0 - 2

**Sodium Absorption Ratio\*\*:** 0

**Soil Reaction (1:1 Water)\*\*:** 7.4 - 8.4

**Available Water Capacity (inches)\*\*:** 3 - 7

**Calcium Carbonate Equivalent (percent)\*\*:** 0 - 15

### **Historic Climax Plant Community:**

\* A complete soil classification table for Kiowa County is located in Appendix E.

\*\*These attributes represent 0-40 inches in depth or to the first restrictive layer.

The historic climax plant community (description follows) has been determined by study of rangeland relic areas, areas protected from excessive disturbance, seasonal use pastures, short durational/time controlled grazing and historical accounts.

The plant community described should not necessarily be thought of as the "Desired Plant Community". According to the USDA NRCS National Range and Pasture Handbook, Desired Plant Communities will be determined by the decision-makers and will meet minimum quality criteria established by the NRCS. The main purpose for, including any description of a plant community here is to capture the current knowledge and experience at the time.

#### **Sand Bluestem, Prairie Sandreed, Switchgrass, Indiangrass Plant Community**

This is the interpretive plant community and is considered to be the Historic Climax Plant Community (HCPC). This plant community evolved with grazing by large herbivores, is well suited for grazing by domestic livestock and can be found on areas that are properly managed with grazing that allows adequate recovery periods following each grazing occurrence during the growing season.

The historic climax plant community consists chiefly of tall warm season grasses. Principle dominants are sand bluestem, prairie sandreed, switchgrass and yellow Indiangrass. Sub-dominant grasses include needleandthread and blue grama. Significant forbs and shrubs are pacific peavine, evening primrose, prairie clovers, leadplant and western sandcherry. The potential vegetation is about 70-85% grasses or grass-like plants, 8-15% forbs and 7-15% shrubs.

Prescribed grazing that allows for adequate recovery periods after each grazing event and proper stocking will maintain this plant community. Continual or repeated spring grazing and summer deferment will reduce the cool season component of this plant community and increase the warm season component. Spring deferment and continual or repeated summer grazing will increase the cool season component and decrease the warm season component of this plant community.

This plant community is well adapted to the Northern Great Plains climatic conditions and is resistant to many disturbances except continuous grazing, plowing, uncontrolled fire events and urban as well as other land use development. The diversity in plant species allows for high drought tolerance. Plant litter is properly distributed with very little movement off-site and natural plant mortality is very low. This is a sustainable plant community in terms of soil stability, watershed function and biologic integrity.

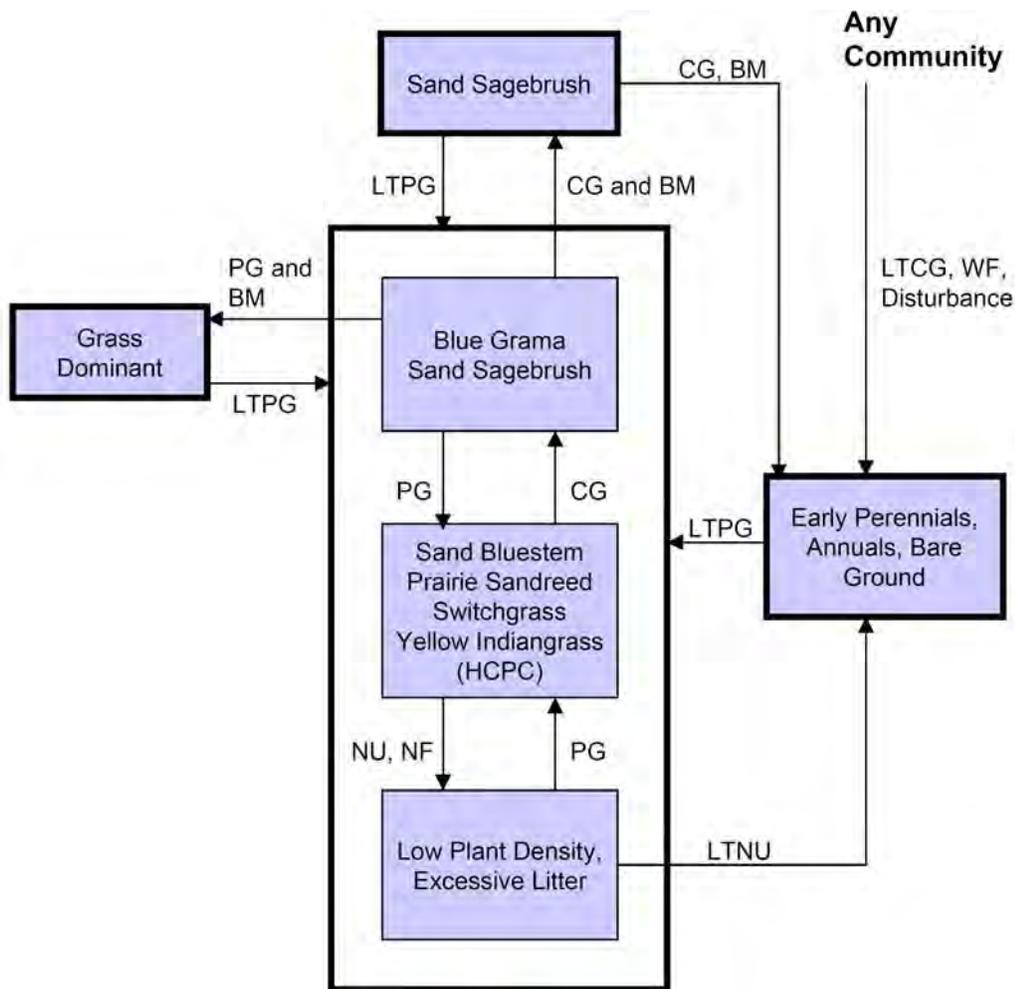
Production in this community can vary from 1200 to 2400 pounds of air-dry vegetation per acre per year depending on the weather conditions and will average 1850 pounds.

#### ***Plant Communities and Transitional Pathways***

Continuous grazing without adequate recovery opportunities following each grazing event during the growing season will initially cause blue grama and sand sagebrush to increase. Species such as sand bluestem, yellow Indiangrass, switchgrass, prairie sandreed, western sandcherry, leadplant and palatable forbs will decrease in frequency and production. Brush management (spraying) will initially reduce sand sagebrush as well as other important forbs and shrubs. Brush management followed by continuous grazing can eliminate remaining grass leaving established or reestablishing sagebrush. Prescribed grazing that allows adequate recovery periods following brush management will result in a grass dominated plant community.

Non-use, continuous grazing, wildfire, brush management or any type of physical disturbance can cause erosion to increase on these fragile soils.

The following diagram illustrates the common plant communities that can occur on the site and the transition pathways (arrows) among communities. Bold lines surrounding each plant community or communities represent ecological thresholds (USDA, NRCS 2004). The ecological processes are discussed in more detail in the Ecological Site Description from the NRCS Field Office Technical Guide.



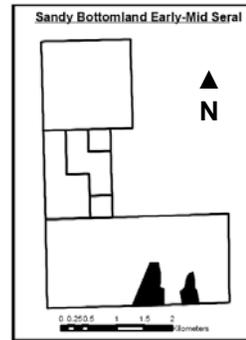
**BM** - brush management, **CG** - continuous grazing without adequate recovery period, **HCPC** - Historic Climax Plant Community, **LTCG** - long term continuous grazing (>25 yrs), **LTNU** - long term non-use (>25 yrs), **LTPG** - long term prescribed grazing (>20yrs), **NF** - no fire, **NU** - non-use, **PG** - prescribed grazing with adequate recovery period, **WF** - wildfire

**Figure 90: Sandy Bottomland State and Transition Model** - Diagram of the Sandy Bottomland Ecological Site MRLA 67B community states and transitions (USDA, NRCS 2004).

## Sandy Bottomland Early-Mid Seral

This area has transitioned to a **Blue Grama, Sand Sagebrush Plant Community**, a state usually reached through continuous grazing. The dominant grasses from the HCPC, sand bluestem, prairie sandreed, switchgrass, and yellow Indiangrass, were not detected. The current dominant grass species were detected at 9.50% ( $\pm 0.55$ ) sand dropseed, 7.85% ( $\pm 0.60$ ) blue grama, 7.07% ( $\pm 0.61$ ) sixweeks fescue, and 5.19% ( $\pm 0.59$ ) red threeawn. Most dominant forbs from the HCPC were not detected, including Pacific peavine, narrowleaf penstemon, purple prairie clover, and silky prairie clover. The other dominant forb, dotted gayfeather, was detected below the HCPC level at 0.11% ( $\pm 0.11$ ). The current dominant forb species were detected at a relative abundance of 6.08% ( $\pm 0.61$ ) scarlet globemallow, 4.64% ( $\pm 0.58$ ) woolly plantain, 4.53% ( $\pm 0.58$ ) conyza, and 3.65% ( $\pm 0.79$ ) beggars tick. Most dominant shrubs of the HCPC were not detected, including western sandcherry and leadplant. The other dominant shrub, sand sagebrush, was detected above the HCPC level at 10.09% ( $\pm 0.79$ ). Plains pricklypear and brittle cactus were detected at suitable amounts for the HCPC at 0.33% ( $\pm 0.19$ ) and 0.11% ( $\pm 0.11$ ), respectively.

The Blue Grama, Sand Sagebrush Plant Community is stable but has lost many tallgrass species, important forbs, and shrubs. This composition can jeopardize the biotic integrity of the community. This state can also alter the nutrient/water/energy cycles and is an early stage of desertification. Although many of the dominant species of the HCPC are not found within the Sandy Bottomland Early-Mid Seral stratum, most of the species are found within the SCMNHS. Species not found on the SCMNHS include: yellow Indiangrass, sandhill muhly, Pacific peavine, narrowleaf penstemon, silky prairie clover, western sandcherry, and leadplant. However, these species may be present on neighboring lands.



## Sandy Bottomland Early-Mid Seral

**Site Type:** Rangeland

**Site Name:** Sandy Bottomland

**Site ID:** R067BY031CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 120

**Date:** June 2005

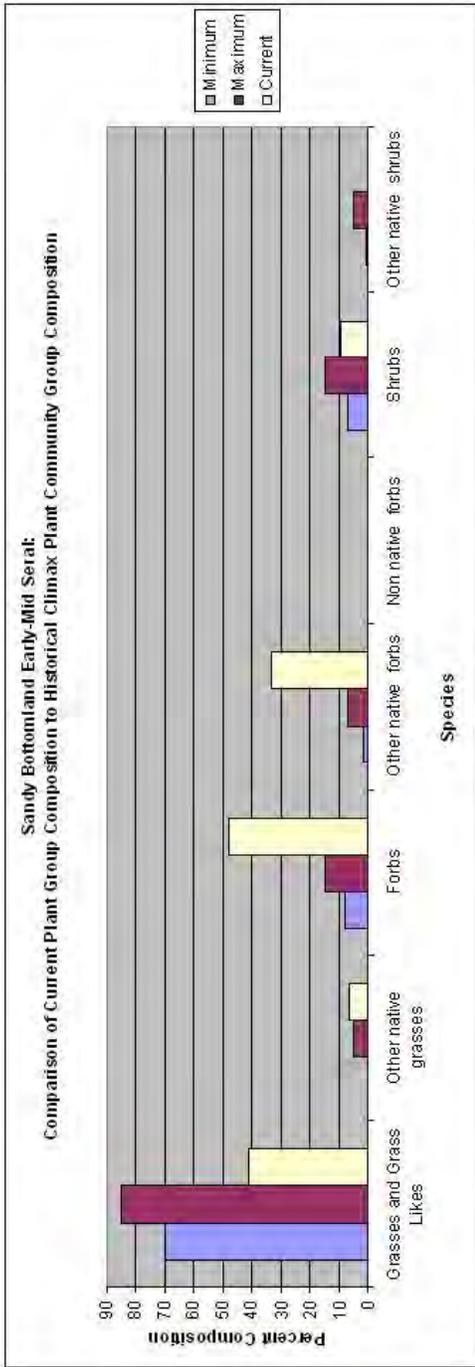
**Table 34: Sandy Bottomland Early-Mid Seral Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>		70-85	41.10	4.92
sand bluestem	<i>Andropogon hallii</i>	25-30	0.00	0.00
prairie sandreed	<i>Calamovilfa longifolia</i>	15-25	0.00	0.00
switchgrass	<i>Panicum virgatum</i>	10-20	0.00	0.00
yellow Indiangrass	<i>Sorghastrum nutans</i>	5-10	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	5-7	2.65	0.49
blue grama	<i>Bouteloua gracilis</i>	1-5	7.85	0.60
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.00	0.00
western wheatgrass	<i>Pascopyrum smithii</i>	1-5	2.21	0.45
Canada wildrye	<i>Elymus canadensis</i>	1-3	0.00	0.00
sand dropseed	<i>Sporobolus cryptandrus</i>	1-3	9.50	0.55
tall dropseed	<i>Sporobolus compositus var. compositus</i>	1-3	0.00	0.00
sideoats grama	<i>Bouteloua curtipendula</i>	0-3	0.00	0.00
blowout grass	<i>Redfieldia flexuosa</i>	1-2	0.00	0.00
hairy grama	<i>Bouteloua hirsuta</i>	1-2	0.00	0.00
Indian ricegrass	<i>Achnatherum hymenoides</i>	1-2	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	1-2	5.19	0.59
sand paspalum	<i>Paspalum setaceum</i>	1-2	0.00	0.00
sandhill muhly	<i>Muhlenbergia pungens</i>	1-2	0.00	0.00
inland saltgrass	<i>Distichlis spicata</i>	0-1	0.00	0.00
prairie junegrass	<i>Koeleria macrantha</i>	0-1	0.00	0.00
sixweeks fescue	<i>Vulpia octoflora</i>	0-1	7.07	0.61
thickspike wheatgrass	<i>Elymus lanceolatus ssp. lanceolatus</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
thinstem flatsedge	<i>Cyperus lupulinus</i>	0-1	0.00	0.00
<b>Other native grasses</b>		0-5	6.63	1.63
alkali sacaton	<i>Sporobolus airoides</i>		0.22	0.16
bottlebrush squirreltail	<i>Elymus elymoides</i>		1.66	0.40
buffalograss	<i>Buchloe dactyloides</i>		0.44	0.22
inland saltgrass	<i>Distichlis spicata</i>		3.20	0.52
tumblegrass	<i>Schedonnardus paniculatus</i>		1.10	0.34
<b>Forbs</b>		8-15	47.96	10.93
Pacific peavine	<i>Lathyrus polymorphus</i>	1-3	0.00	0.00
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.11	0.11
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00

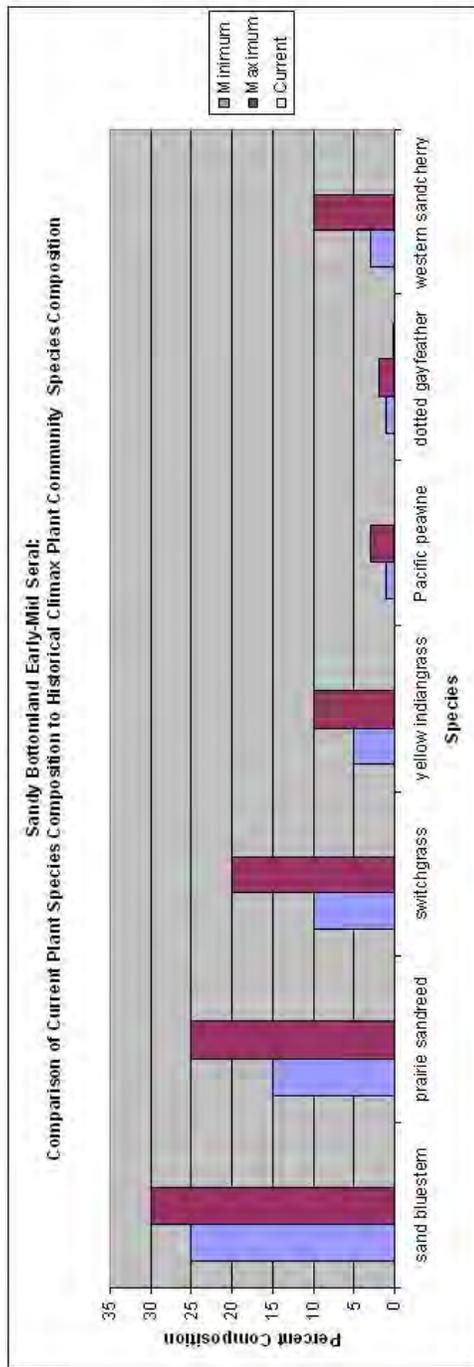
purple prairie clover	<i>Dalea purpurea</i>	1-2	0.00	0.00
silky prairie clover	<i>Dalea villosa</i>	1-2	0.00	0.00
annual buckwheat	<i>Eriogonum annuum</i>	0-1	0.00	0.00
bigtop dalea	<i>Dalea enneandra</i>	0-1	0.11	0.11
bush morning glory	<i>Ipomoea leptophylla</i>	0-1	0.00	0.00
death camas	<i>Zigadenus venenosus</i>	0-1	0.00	0.00
hairy goldenaster	<i>Heterotheca villosa</i>	0-1	1.22	0.35
heath aster	<i>Symphyotrichum ericoides</i>	0-1	0.22	0.16
Hoods phlox	<i>Phlox hoodii</i>	0-1	0.00	0.00
lemon scurfpea	<i>Psoraleidium lanceolatum</i>	0-1	0.00	0.00
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	1.22	0.35
Nuttalls evolvulus	<i>Evolvulus nuttallianus</i>	0-1	1.33	0.36
painted milkvetch	<i>Astragalus ceramicus var. filifolius</i>	0-1	0.00	0.00
pale evening-primrose	<i>Oenothera albicaulis</i>	0-1	0.00	0.00
prairie larkspur	<i>Delphinium carolinianum</i>	0-1	0.00	0.00
prairie spiderwort	<i>Tradescantia occidentalis</i>	0-1	0.00	0.00
sand lily	<i>Leucocrinum montanum</i>	0-1	0.00	0.00
scarlet globemallow	<i>Sphaeralcea coccinea</i>	0-1	6.08	0.61
snowball sand verbena	<i>Ambronia fragans</i>	0-1	0.00	0.00
stiff sunflower	<i>Helianthus pauciflorus ssp. pauciflorus</i>	0-1	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	0-1	2.65	0.49
western ragweed	<i>Ambrosia psilostachya</i>	0-1	1.22	0.35
<b>Other native forbs</b>		<b>2-7</b>	<b>33.26</b>	<b>7.80</b>
beggars tick	<i>Cryptantha circumscissa</i>		3.65	0.54
blanket flower	<i>Gaillardia pulchella</i>		0.44	0.22
buffalo bur	<i>Solanum rostratum</i>		0.66	0.26
clammy groundcherry	<i>Physalis heterophylla</i>		0.22	0.16
common sunflower	<i>Helianthus annuus</i>		0.33	0.19
ironplant goldenweed	<i>Haplopappus spinulosus</i>		1.99	0.43
evening primrose	<i>Oenothera spp.</i>		2.43	0.47
fame flower	<i>Talinum parviflorum</i>		2.54	0.48
frog fruit	<i>Lippia cuneifolia</i>		0.11	0.11
Hopi tea greenthread	<i>Thelesperma megapotamicum</i>		0.11	0.11
Hymenopappus sp.	<i>Hymenopappus sp.</i>		0.33	0.19
narrowleaf fourclock	<i>Mirabilis linearis</i>		0.77	0.28
narrowleaf stoneseed	<i>Lithospermum incisum</i>		0.44	0.22
Packera sp.	<i>Packera sp.</i>		0.22	0.16
palmleaf scurfpea	<i>Psoralea digitata</i>		0.11	0.11
pepperpod mustard	<i>Lepidium densiflorum</i>		3.09	0.51
prairie groundcherry	<i>Physalis pumila</i>		0.33	0.19
scarlet gaura	<i>Gaura coccinea</i>		2.76	0.49
flaxflowered ipomopsis	<i>Ipomopsis longiflora</i>		1.77	0.41
stiff flax	<i>Linum rigidum</i>		0.44	0.22
stinking milkvetch	<i>Astragalus praelongus var. ellisiae</i>		0.11	0.11
wallflower	<i>Erysimum asperum</i>		0.11	0.11
wavyleaf thistle	<i>Cirsium undulatum</i>		0.22	0.16
western fleabane	<i>Erigeron bellidiastrum</i>		0.55	0.24
winecup	<i>Callirhoe involucrata</i>		0.22	0.16
woolly locoweed	<i>Astragalus mollissimus</i>		0.11	0.11
conyza	<i>Conyza canadensis</i>		4.53	0.58

woolly Indianwheat	<i>Plantago patagonica</i>		4.64	0.58
<b>Non native forbs</b>		0	0.55	0.24
Russian thistle	<i>Salsola iberica</i>		0.55	0.24
<b>Unidentified forbs</b>				
UF20			1.77	0.41
<b>Shrubs</b>		7-15	9.17	0.88
western sandcherry	<i>Prunus pumila</i>	3-10	0.00	0.00
leadplant	<i>Amorpha canescens</i>	2-7	0.00	0.00
sand sagebrush	<i>Artemisia filifolia</i>	1-5	8.73	0.58
prairie rose	<i>Rosa arkansana</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.33	0.19
purple pincushion	<i>Escobaria vivipara var. vivipara</i>	0-1	0.00	0.00
skunkbrush sumac	<i>Rhus trilobata</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.00	0.00
spreading buckwheat	<i>Eriogonum effusum</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-5	0.11	0.11
brittle cactus	<i>Opuntia fragilis</i>		0.11	0.11

<b>Ground Cover</b>	
Type	% Cover
Plant	32.22
Litter	47.78
Bare	20.00
Rock	0.00
n	720



**Figure 92: Sandy Bottomland Early-Mid Seral Plant Group Composition** - This graph depicts the current plant group composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that plant group on the Ecological Site. The yellow is the current group composition.



**Figure 91: Sandy Bottomland Early-Mid Seral Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

### Sandy Bottomland Early-Mid Seral



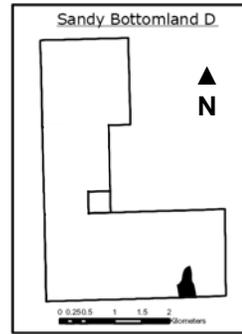
**Figure 93: Photographs of Sandy Bottomland Early-Mid Seral** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Sandy Bottomland D

The Sandy Bottomland D stratum is located on southeast portion of the property. Sandy Bottomland D is southwest of Sand Creek and occupies NPS land on section 30 T17S R45W.

This area has transitioned to a **Blue Grama, Sand Sagebrush Plant Community**, a state usually reached through continuous grazing. The dominant grasses from the HCPC, sand bluestem, prairie sandreed, switchgrass, and yellow Indiangrass, were not detected. The current dominant grass species were detected at 13.53% ( $\pm$  0.23) blue grama, 11.24% ( $\pm$  0.69) sand dropseed, 8.94% ( $\pm$  0.85) sixweeks fescue, 6.88% ( $\pm$  0.57) needleandthread, and 3.21% ( $\pm$  0.76) prairie sandreed. Most dominant forbs from the HCPC were not detected, including Pacific peavine, narrowleaf penstemon, purple prairie clover, and silky prairie clover. The other dominant forb, dotted gayfeather, was detected below the HCPC level at 0.24% ( $\pm$  0.24). The current dominant forb species were detected at a relative abundance of 5.28% ( $\pm$  0.87) scarlet globemallow, 4.59% ( $\pm$  0.84) pepperpod mustard, 4.13% ( $\pm$  0.82) woolly Indianwheat, and 3.67% ( $\pm$  0.79) conyza. Most dominant shrubs of the HCPC were not detected, including western sandcherry and leadplant. The other dominant shrub sand sagebrush was detected above the HCPC level at 8.07% ( $\pm$  0.95). Brittle cactus was also detected at 0.24% ( $\pm$  0.24).

The Blue Grama, Sand Sagebrush Plant Community is stable but has lost many tallgrass species, important forbs, and shrubs. This composition can jeopardize the biotic integrity of the community. This state can also alter the nutrient/water/energy cycles and is an early stage of desertification. Although many of the dominant species of the HCPC are not found within the Sandy Bottomland D stratum, most of the species are found within the SCMNHS. Species not found on the SCMNHS include: yellow Indiangrass, sandhill muhly, Pacific peavine, narrowleaf penstemon, silky prairie clover, western sandcherry, and leadplant. However, these species may be present on neighboring lands.



## Sandy Bottomland D

**Site Type:** Rangeland

**Site Name:** Sandy Bottomland

**Site ID:** R067BY031CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 60

**Date:** June 2005

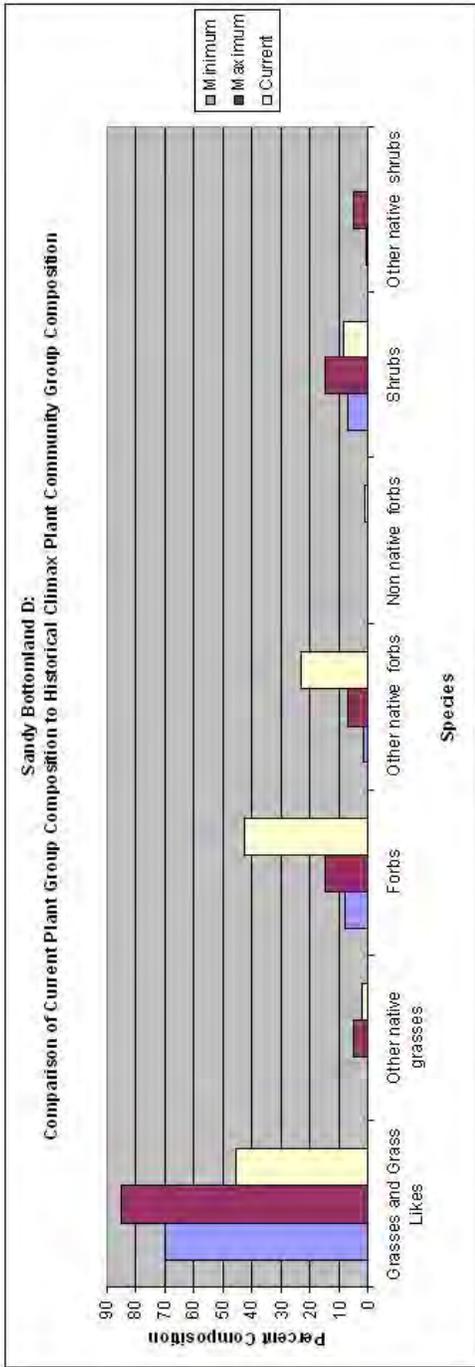
**Table 35: Sandy Bottomland D Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>		70-85	45.48	6.60
sand bluestem	<i>Andropogon hallii</i>	25-30	0.00	0.00
prairie sandreed	<i>Calamovilfa longifolia</i>	15-25	0.00	0.00
switchgrass	<i>Panicum virgatum</i>	10-20	0.00	0.00
yellow Indiangrass	<i>Sorghastrum nutans</i>	5-10	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	5-7	0.73	0.42
blue grama	<i>Bouteloua gracilis</i>	1-5	11.98	0.74
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.00	0.00
western wheatgrass	<i>Pascopyrum smithii</i>	1-5	4.89	0.90
Canada wildrye	<i>Elymus canadensis</i>	1-3	0.00	0.00
sand dropseed	<i>Sporobolus cryptandrus</i>	1-3	7.09	0.95
tall dropseed	<i>Sporobolus compositus var. compositus</i>	1-3	0.00	0.00
sideoats grama	<i>Bouteloua curtipendula</i>	0-3	0.00	0.00
blowout grass	<i>Redfieldia flexuosa</i>	1-2	0.00	0.00
hairy grama	<i>Bouteloua hirsuta</i>	1-2	0.00	0.00
Indian ricegrass	<i>Achnatherum hymenoides</i>	1-2	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	1-2	2.20	0.68
sand paspalum	<i>Paspalum setaceum</i>	1-2	0.00	0.00
sandhill muhly	<i>Muhlenbergia pungens</i>	1-2	0.00	0.00
inland saltgrass	<i>Distichlis spicata</i>	0-1	5.38	0.92
prairie junegrass	<i>Koeleria macrantha</i>	0-1	0.00	0.00
sixweeks fescue	<i>Vulpia octoflora</i>	0-1	11.00	0.83
thickspike wheatgrass	<i>Elymus lanceolatus ssp. lanceolatus</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
thinstem flatsedge	<i>Cyperus lupulinus</i>	0-1	0.00	0.00
<b>Other native grasses</b>		0-5	2.20	1.16
alkali sacaton	<i>Sporobolus airoides</i>		0.49	0.34
bottlebrush squirreltail	<i>Elymus elymoides</i>		1.47	0.57
buffalograss	<i>Buchloe dactyloides</i>		0.24	0.24
<b>Forbs</b>		8-15	42.54	13.59
Pacific peavine	<i>Lathyrus polymorphus</i>	1-3	0.00	0.00
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.24	0.24
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	1-2	0.00	0.00
silky prairie clover	<i>Dalea villosa</i>	1-2	0.00	0.00

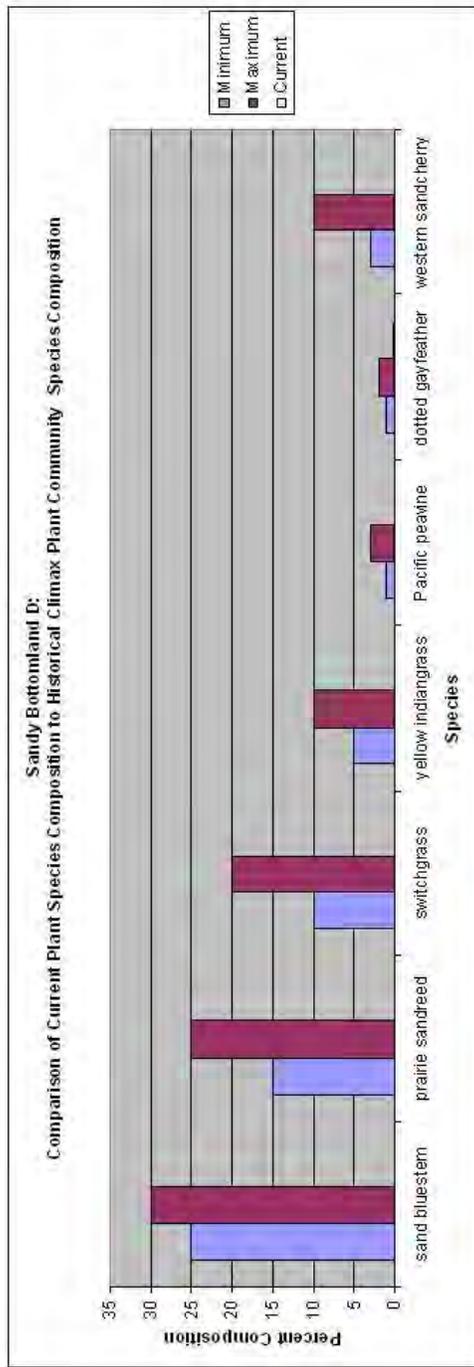
annual buckwheat	<i>Eriogonum annuum</i>	0-1	4.16	0.86
bigtop dalea	<i>Dalea enneandra</i>	0-1	0.00	0.00
bush morning glory	<i>Ipomoea leptophylla</i>	0-1	0.00	0.00
death camas	<i>Zigadenus venenosus</i>	0-1	0.00	0.00
hairy goldenaster	<i>Heterotheca villosa</i>	0-1	0.24	0.24
heath aster	<i>Symphotrichum ericoides</i>	0-1	0.00	0.00
Hoods phlox	<i>Phlox hoodii</i>	0-1	0.00	0.00
lemon scurfpea	<i>Psoralegium lanceolatum</i>	0-1	0.00	0.00
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	2.20	0.68
Nuttalls evolulus	<i>Evolvulus nuttallianus</i>	0-1	0.49	0.34
painted milkvetch	<i>Astragalus ceramicus var. filifolius</i>	0-1	0.00	0.00
pale evening-primrose	<i>Oenothera albicaulis</i>	0-1	0.00	0.00
prairie larkspur	<i>Delphinium carolinianum</i>	0-1	0.00	0.00
prairie spiderwort	<i>Tradescantia occidentalis</i>	0-1	0.00	0.00
sand lily	<i>Leucocrocinum montanum</i>	0-1	0.00	0.00
scarlet globemallow	<i>Sphaeralcea coccinea</i>	0-1	6.85	0.95
snowball sand verbena	<i>Ambronia fragans</i>	0-1	0.00	0.00
stiff sunflower	<i>Helianthus pauciflorus ssp. pauciflorus</i>	0-1	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	0-1	3.18	0.79
western ragweed	<i>Ambrosia psilostachya</i>	0-1	0.49	0.34
<b>Other native forbs</b>		2-7	23.47	8.60
beggars tick	<i>Cryptantha circumscissa</i>		1.47	0.57
buffalo bur	<i>Solanum rostratum</i>		1.47	0.57
conyza	<i>Conyza canadensis</i>		1.96	0.65
ironplant goldenweed	<i>Haplopappus spinulosus</i>		2.69	0.74
evening primrose	<i>Oenothera sp.</i>		0.98	0.48
flaxflowered ipomopsis	<i>Ipomopsis longiflora</i>		2.69	0.74
frog fruit	<i>Lippia cuneifolia</i>		0.24	0.24
Hopi tea greenthread	<i>Thelesperma megapotamicum</i>		0.24	0.24
Hymenopappus sp.	<i>Hymenopappus sp.</i>		0.49	0.34
narrowleaf fourclock	<i>Mirabilis linearis</i>		0.24	0.24
narrowleaf stoneseed	<i>Lithospermum incisum</i>		0.24	0.24
pepperpod mustard	<i>Lepidium densiflorum</i>		1.47	0.57
prairie groundcherry	<i>Physalis pumila</i>		0.24	0.24
scarlet gaura	<i>Gaura coccinea</i>		3.91	0.84
stiff flax	<i>Linum rigidum</i>		0.98	0.48
stinking milkvetch	<i>Astragalus praelongus var. ellisiae</i>		0.24	0.24
winecup	<i>Callirhoe involucrata</i>		0.49	0.34
woolly Indianwheat	<i>Plantago patagonica</i>		3.42	0.81
<b>Non native forbs</b>		0	1.22	0.53
Russian thistle	<i>Salsola iberica</i>		1.22	0.53
<b>Unidentified forbs</b>				
UF20			3.67	0.83
<b>Shrubs</b>		7-15	8.31	1.19
western sandcherry	<i>Prunus pumila</i>	3-10	0.00	0.00
leadplant	<i>Amorpha canescens</i>	2-7	0.00	0.00
sand sagebrush	<i>Artemisia filifolia</i>	1-5	8.07	0.95
prairie rose	<i>Rosa arkansana</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.00	0.00

purple pincushion	<i>Escobaria vivipara var. vivipara</i>	0-1	0.00	0.00
skunkbrush sumac	<i>Rhus trilobata</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.00	0.00
spreading buckwheat	<i>Eriogonum effusum</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-5	0.24	0.24
brittle cactus	<i>Opuntia fragilis</i>		0.24	0.24

<b>Ground Cover</b>	
Type	% Cover
Plant	30.56
Litter	46.94
Bare	22.50
Rock	0.00
n	360



**Figure 95: Sandy Bottomland D Plant Group Composition** - This graph depicts the current plant group composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that plant group on the Ecological Site.



**Figure 94: Sandy Bottomland D Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

## Sandy Bottomland D



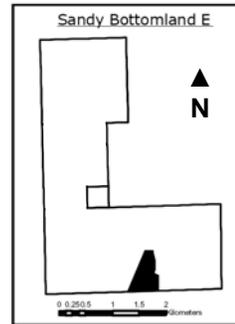
**Figure 96: Photographs of Sandy Bottomland D** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Sandy Bottomland E

The Sandy Bottomland E stratum is located on south portion of the property. Sandy Bottomland E is south of Sand Creek and occupies NPS land on section 30 T17S R45W.

This area has transitioned to a **Blue Grama, Sand Sagebrush Plant Community**, a state usually reached through continuous grazing. The stratum also shows signs of transitioning to an Early Perennials, Annuals and Bare Ground Plant Community, a state usually reached though long term continuous grazing or long term nonuse. The dominant grasses from the HCPC, sand bluestem, prairie sandreed, switchgrass, and yellow Indiangrass, were not detected. The current dominant grass species were detected at 11.49% ( $\pm 0.34$ ) sand dropseed, 7.66% ( $\pm 0.76$ ) red threeawn, 4.44% ( $\pm 0.76$ ) blue grama, 4.23% ( $\pm 0.75$ ) needleandthread, and 3.83% ( $\pm 0.73$ ) sixweeks fescue. The dominant forbs from the HCPC, Pacific peavine, dotted gayfeather, narrowleaf penstemon, purple prairie clover, and silky prairie clover, were not detected. The current dominant forb species were detected at a relative abundance of 6.65% ( $\pm 0.78$ ) conyza, 5.65% ( $\pm 0.79$ ) woolly Indianwheat, 5.44% ( $\pm 0.78$ ) beggars tick, and 5.44% ( $\pm 0.78$ ) scarlet globemallow. Most dominant shrubs of the HCPC were not detected, including western sandcherry and leadplant. The other dominant shrub sand sagebrush was detected above the HCPC level at 9.27% ( $\pm 0.67$ ). Plains pricklypear was detected at a suitable amount for the HCPC at 0.60% ( $\pm 0.34$ ).

The Blue Grama, Sand Sagebrush Plant Community is stable but has lost many tallgrass species, important forbs, and shrubs. This composition can jeopardize the biotic integrity of the community. This state can also alter the nutrient/water/energy cycles and is an early stage of desertification. Erosion is of great concern for the Early Perennials, Annuals and Bare Ground Plant Community. Although many of the dominant species of the HCPC are not found within the Sandy Bottomland E stratum, most of the species are found within the SCMNHS. Species not found on the SCMNHS include: yellow Indiangrass, sandhill muhly, Pacific peavine, narrowleaf penstemon, silky prairie clover, western sandcherry, and leadplant. However, these species may be present on neighboring lands.



## Sandy Bottomland E

**Site Type:** Rangeland

**Site Name:** Sandy Bottomland

**Site ID:** R067BY031CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 60

**Date:** June 2005

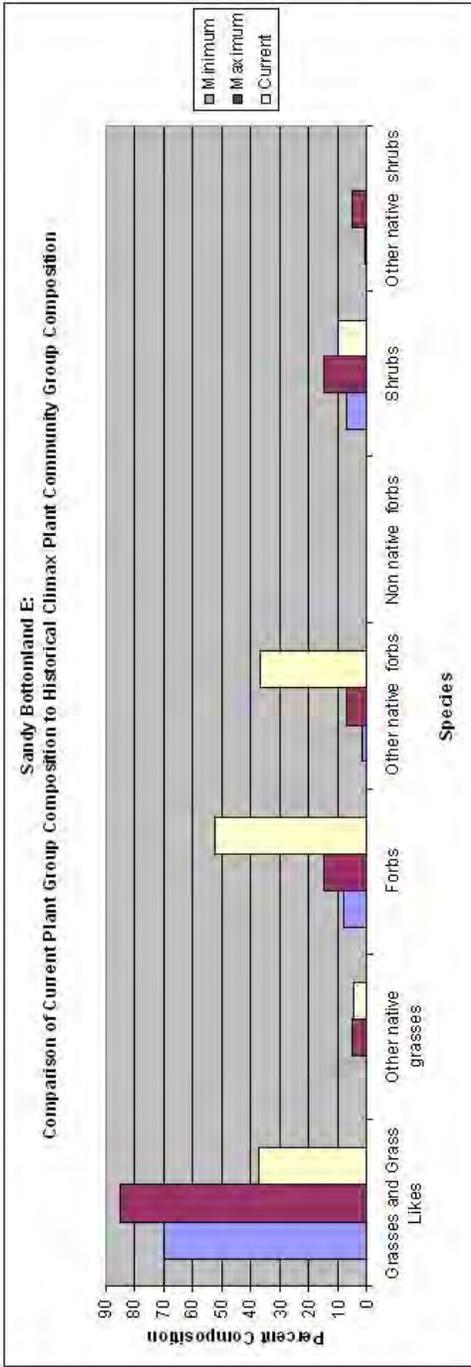
**Table 36: Sandy Bottomland E Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>		70-85	37.50	5.34
sand bluestem	<i>Andropogon hallii</i>	25-30	0.00	0.00
prairie sandreed	<i>Calamovilfa longifolia</i>	15-25	0.00	0.00
switchgrass	<i>Panicum virgatum</i>	10-20	0.00	0.00
yellow Indiangrass	<i>Sorghastrum nutans</i>	5-10	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	5-7	4.23	0.75
blue grama	<i>Bouteloua gracilis</i>	1-5	4.44	0.76
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.00	0.00
western wheatgrass	<i>Pascopyrum smithii</i>	1-5	0.00	0.00
Canada wildrye	<i>Elymus canadensis</i>	1-3	0.00	0.00
sand dropseed	<i>Sporobolus cryptandrus</i>	1-3	11.49	0.34
tall dropseed	<i>Sporobolus compositus var. compositus</i>	1-3	0.00	0.00
sideoats grama	<i>Bouteloua curtipendula</i>	0-3	0.00	0.00
blowout grass	<i>Redfieldia flexuosa</i>	1-2	0.00	0.00
hairy grama	<i>Bouteloua hirsuta</i>	1-2	0.00	0.00
Indian ricegrass	<i>Achnatherum hymenoides</i>	1-2	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	1-2	7.66	0.76
sand paspalum	<i>Paspalum setaceum</i>	1-2	0.00	0.00
sandhill muhly	<i>Muhlenbergia pungens</i>	1-2	0.00	0.00
inland saltgrass	<i>Distichlis spicata</i>	0-1	1.41	0.51
prairie junegrass	<i>Koeleria macrantha</i>	0-1	0.00	0.00
sixweeks fescue	<i>Vulpia octoflora</i>	0-1	3.83	0.73
thickspike wheatgrass	<i>Elymus lanceolatus ssp. lanceolatus</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
thinstem flatsedge	<i>Cyperus lupulinus</i>	0-1	0.00	0.00
<b>Other native grasses</b>		0-5	4.44	1.49
bottlebrush squirreltail	<i>Elymus elymoides</i>		1.81	0.56
buffalograss	<i>Buchloe dactyloides</i>		0.60	0.34
tumblegrass	<i>Schedonnardus paniculatus</i>		2.02	0.59
<b>Forbs</b>		8-15	52.42	13.63
Pacific peavine	<i>Lathyrus polymorphus</i>	1-3	0.00	0.00
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	1-2	0.00	0.00
silky prairie clover	<i>Dalea villosa</i>	1-2	0.00	0.00

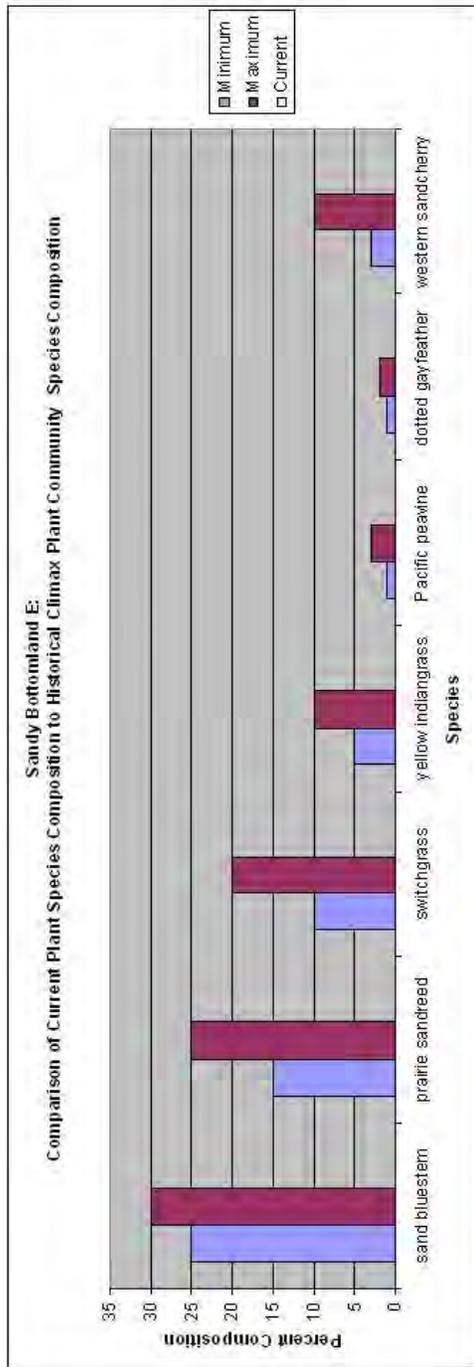
annual buckwheat	<i>Eriogonum annuum</i>	0-1	1.21	0.47
bigtop dalea	<i>Dalea enneandra</i>	0-1	0.20	0.20
bush morning glory	<i>Ipomoea leptophylla</i>	0-1	0.00	0.00
death camas	<i>Zigadenus venenosus</i>	0-1	0.00	0.00
hairy goldenaster	<i>Heterotheca villosa</i>	0-1	2.02	0.59
heath aster	<i>Symphotrichum ericoides</i>	0-1	0.40	0.28
Hoods phlox	<i>Phlox hoodii</i>	0-1	0.00	0.00
lemon scurfpea	<i>Psoralidium lanceolatum</i>	0-1	0.00	0.00
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.40	0.28
Nuttalls evolvulus	<i>Evolvulus nuttallianus</i>	0-1	2.02	0.59
painted milkvetch	<i>Astragalus ceramicus var. filifolius</i>	0-1	0.00	0.00
pale evening-primrose	<i>Oenothera albicaulis</i>	0-1	0.00	0.00
prairie larkspur	<i>Delphinium carolinianum</i>	0-1	0.00	0.00
prairie spiderwort	<i>Tradescantia occidentalis</i>	0-1	0.00	0.00
sand lily	<i>Leucocrinum montanum</i>	0-1	0.00	0.00
scarlet globemallow	<i>Sphaeralcea coccinea</i>	0-1	5.44	0.78
snowball sand verbena	<i>Ambronja fragans</i>	0-1	0.00	0.00
stiff sunflower	<i>Helianthus pauciflorus ssp. pauciflorus</i>	0-1	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	0-1	2.22	0.61
western ragweed	<i>Ambrosia psilostachya</i>	0-1	1.81	0.56
<b>Other native forbs</b>		2-7	36.69	9.26
beggars tick	<i>Cryptantha circumscissa</i>		5.44	0.78
blanket flower	<i>Gaillardia pulchella</i>		0.81	0.39
clammy groundcherry	<i>Physalis heterophylla</i>		0.40	0.28
common sunflower	<i>Helianthus annuus</i>		0.60	0.34
conyza	<i>Conyza canadensis</i>		6.65	0.78
ironplant goldenweed	<i>Haplopappus spinulosus</i>		1.41	0.51
evening primrose	<i>Oenothera sp.</i>		3.63	0.72
flaxflowered ipomopsis	<i>Ipomopsis longiflora</i>		1.01	0.44
groundsel	<i>Senecio integerrimus</i>		0.40	0.28
Hymenopappus sp.	<i>Hymenopappus sp.</i>		0.20	0.20
narrowleaf fourclock	<i>Mirabilis linearis</i>		1.21	0.47
narrowleaf stoneseed	<i>Lithospermum incisum</i>		0.60	0.34
palmleaf scurfpea	<i>Psoralea digitata</i>		0.20	0.20
pepperpod mustard	<i>Lepidium densiflorum</i>		4.44	0.76
prairie groundcherry	<i>Physalis pumila</i>		0.40	0.28
scarlet gaura	<i>Gaura coccinea</i>		1.81	0.56
wallflower	<i>Erysimum asperum</i>		0.20	0.20
wavyleaf thistle	<i>Cirsium undulatum</i>		0.40	0.28
western fleabane	<i>Erigeron bellidiastrum</i>		1.01	0.44
woolly locoweed	<i>Astragalus mollissimus</i>		0.20	0.20
woolly Indianwheat	<i>Plantago patagonica</i>		5.65	0.79
<b>Unidentified forbs</b>				
UF20			0.20	0.20
<b>Shrubs</b>		7-15	9.88	1.01
western sandcherry	<i>Prunus pumila</i>	3-10	0.00	0.00
leadplant	<i>Amorpha canescens</i>	2-7	0.00	0.00
sand sagebrush	<i>Artemisia filifolia</i>	1-5	9.27	0.67
prairie rose	<i>Rosa arkansana</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.60	0.34

purple pincushion	<i>Escobaria vivipara</i> var. <i>vivipara</i>	0-1	0.00	0.00
skunkbrush sumac	<i>Rhus trilobata</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.00	0.00
spreading buckwheat	<i>Eriogonum effusum</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-5	0.00	0.00

<b>Ground Cover</b>	
Type	% Cover
Plant	33.89
Litter	48.61
Bare	17.50
Rock	0.00
n	360



**Figure 98: Sandy Bottomland E Plant Group Composition** - This graph depicts the current plant group composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that plant group on the Ecological Site. The yellow is the current group composition.



**Figure 97: Sandy Bottomland E Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

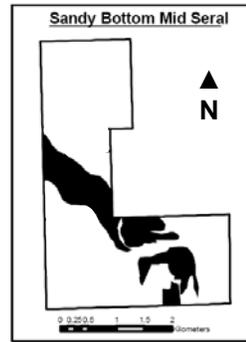
### Sandy Bottomland E



**Figure 99: Photographs of Sandy Bottomland E** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Sandy Bottomland Mid Seral

This area has transitioned to a **Blue Grama, Sand Sagebrush Plant Community**, a state usually reached through continuous grazing. Two dominant grasses from the HCPC, switchgrass and yellow Indiangrass, were not detected. The other dominant grasses, sand bluestem and prairie sandreed, were detected below HCPC levels at 0.14% ( $\pm 0.08$ ) and 2.11% ( $\pm 0.29$ ), respectively. The current dominant grass species were detected at 14.12% ( $\pm 0.20$ ) blue grama, 10.37% ( $\pm 0.39$ ) sand dropseed, and 3.33% ( $\pm 0.35$ ) sixweeks fescue. The dominant forbs from the HCPC, Pacific peavine, dotted gayfeather, narrowleaf penstemon, purple prairie clover, and silky prairie clover, were not detected. The current dominant forb species were detected at a relative abundance of 6.29% ( $\pm 0.41$ ) pepperpod mustard, 5.07% ( $\pm 0.40$ ) conyza, 4.79% ( $\pm 0.39$ ) woolly Indianwheat, and 4.46% ( $\pm 0.38$ ) Russian thistle. Most dominant shrubs of the HCPC were not detected, including western sandcherry and leadplant. The other dominant shrub sand sagebrush was detected above the HCPC level at 10.00% ( $\pm 0.40$ ). Plains pricklypear and brittle cactus were detected at suitable amounts for the HCPC at 0.23% ( $\pm 0.10$ ) and 0.42% ( $\pm 0.14$ ), respectively.



The Blue Grama, Sand Sagebrush Plant Community is stable but has lost many tallgrass species, important forbs, and shrubs. This composition can jeopardize the biotic integrity of the community. This state can also alter the nutrient/water/energy cycles and is an early stage of desertification. Although many of the dominant species of the HCPC are not found within the Sandy Bottomland Mid Seral stratum, most of the species are found within the SCMNHS. Species not found on the SCMNHS include: yellow Indiangrass, sandhill muhly, Pacific peavine, narrowleaf penstemon, silky prairie clover, western sandcherry, and leadplant. However, these species may be present on neighboring lands.

## Sandy Bottomland Mid Seral

**Site Type:** Rangeland

**Site Name:** Sandy Bottomland

**Site ID:** R067BY031CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 320

**Date:** June 2005

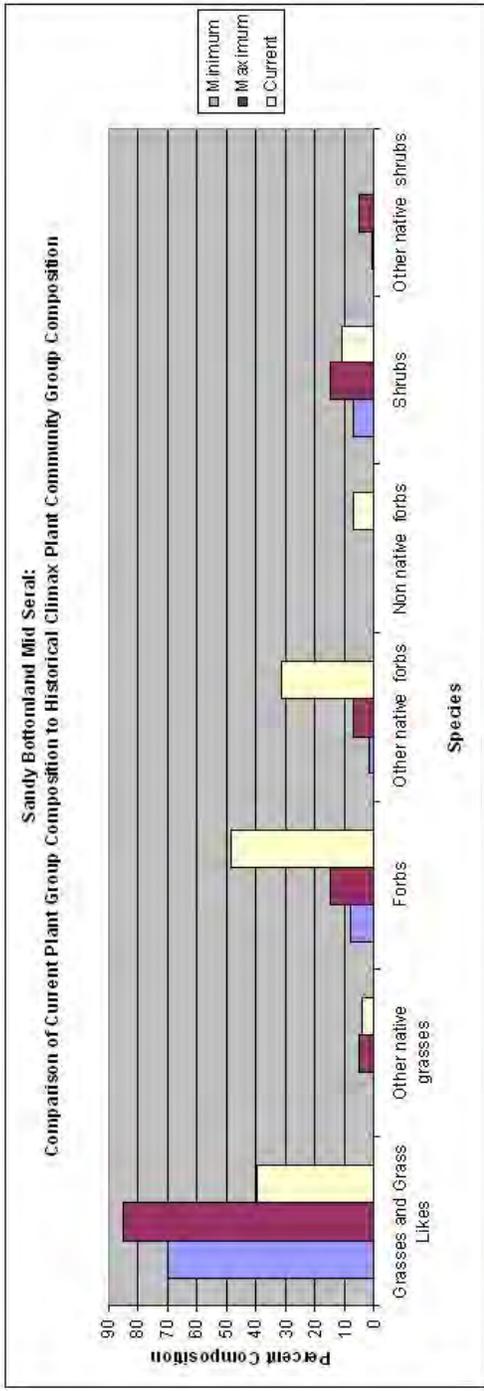
**Table 37: Sandy Bottomland Mid Seral Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>		70-85	39.47	3.22
sand bluestem	<i>Andropogon hallii</i>	25-30	0.14	0.08
prairie sandreed	<i>Calamovilfa longifolia</i>	15-25	2.11	0.29
switchgrass	<i>Panicum virgatum</i>	10-20	0.00	0.00
yellow Indiangrass	<i>Sorghastrum nutans</i>	5-10	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	5-7	2.39	0.31
blue grama	<i>Bouteloua gracilis</i>	1-5	14.12	0.20
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.00	0.00
western wheatgrass	<i>Pascopyrum smithii</i>	1-5	0.80	0.19
Canada wildrye	<i>Elymus canadensis</i>	1-3	0.00	0.00
sand dropseed	<i>Sporobolus cryptandrus</i>	1-3	10.37	0.39
tall dropseed	<i>Sporobolus compositus var. compositus</i>	1-3	0.14	0.08
sideoats grama	<i>Bouteloua curtipendula</i>	0-3	0.00	0.00
blowout grass	<i>Redfieldia flexuosa</i>	1-2	0.00	0.00
hairy grama	<i>Bouteloua hirsuta</i>	1-2	0.05	0.05
Indian ricegrass	<i>Achnatherum hymenoides</i>	1-2	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	1-2	1.78	0.27
sand paspalum	<i>Paspalum setaceum</i>	1-2	0.00	0.00
sandhill muhly	<i>Muhlenbergia pungens</i>	1-2	0.00	0.00
inland saltgrass	<i>Distichlis spicata</i>	0-1	0.00	0.00
prairie junegrass	<i>Koeleria macrantha</i>	0-1	0.00	0.00
sixweeks fescue	<i>Vulpia octoflora</i>	0-1	3.33	0.35
thickspike wheatgrass	<i>Elymus lanceolatus ssp. lanceolatus</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
thinstem flatsedge	<i>Cyperus lupulinus</i>	0-1	0.00	0.00
<b>Other native grasses</b>		0-5	4.22	1.02
alkali sacaton	<i>Sporobolus airoides</i>		0.05	0.05
bottlebrush squirreltail	<i>Elymus elymoides</i>		0.42	0.14
buffalograss	<i>Buchloe dactyloides</i>		1.27	0.23
inland saltgrass	<i>Distichlis spicata</i>		1.55	0.26
little annual barley	<i>Hordeum pusillum</i>		0.05	0.05
ring muhly	<i>Muhlenbergia torreyi</i>		0.75	0.18
tumblegrass	<i>Schedonnardus paniculatus</i>		0.09	0.07
windmill grass	<i>Chloris verticillata</i>		0.05	0.05
<b>Forbs</b>		8-15	48.52	7.89

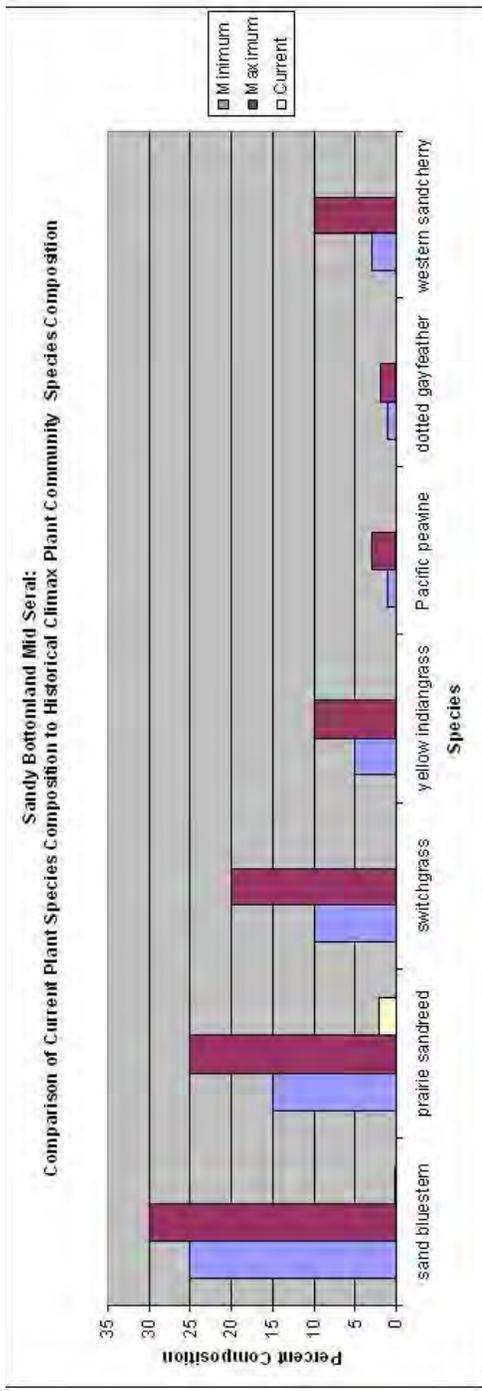
Pacific peavine	<i>Lathyrus polymorphus</i>	1-3	0.00	0.00
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	1-2	0.00	0.00
silky prairie clover	<i>Dalea villosa</i>	1-2	0.00	0.00
annual buckwheat	<i>Eriogonum annuum</i>	0-1	2.72	0.32
bigtop dalea	<i>Dalea enneandra</i>	0-1	0.00	0.00
bush morning glory	<i>Ipomoea leptophylla</i>	0-1	0.33	0.12
death camas	<i>Zigadenus venenosus</i>	0-1	0.00	0.00
hairy goldenaster	<i>Heterotheca villosa</i>	0-1	0.94	0.20
heath aster	<i>Symphyotrichum ericoides</i>	0-1	0.23	0.10
Hoods phlox	<i>Phlox hoodii</i>	0-1	0.00	0.00
lemon scurfpea	<i>Psoraleidium lanceolatum</i>	0-1	0.38	0.13
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.56	0.16
Nuttalls evolvulus	<i>Evolvulus nuttallianus</i>	0-1	0.42	0.14
painted milkvetch	<i>Astragalus ceramicus</i> var. <i>filifolius</i>	0-1	0.00	0.00
pale evening-primrose	<i>Oenothera albicaulis</i>	0-1	0.00	0.00
prairie larkspur	<i>Delphinium carolinianum</i>	0-1	0.00	0.00
prairie spiderwort	<i>Tradescantia occidentalis</i>	0-1	0.05	0.05
sand lily	<i>Leucocrocinum montanum</i>	0-1	0.00	0.00
scarlet globemallow	<i>Sphaeralcea coccinea</i>	0-1	3.24	0.35
snowball sand verbena	<i>Ambronia fragans</i>	0-1	0.05	0.05
stiff sunflower	<i>Helianthus pauciflorus</i> ssp. <i>pauciflorus</i>	0-1	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	0-1	1.08	0.22
western ragweed	<i>Ambrosia psilostachya</i>	0-1	0.38	0.13
<b>Other native forbs</b>		<b>2-7</b>	<b>31.02</b>	<b>5.15</b>
American licorice	<i>Glycyrrhiza lepidota</i>		0.05	0.05
Astragalus sp.	<i>Astragalus</i> sp.		0.05	0.05
Astragalus sp. #2	<i>Astragalus</i> sp.		0.09	0.07
beggars tick	<i>Cryptantha circumscissa</i>		3.89	0.37
blanket flower	<i>Gaillardia pulchella</i>		0.05	0.05
buffalo bur	<i>Solanum rostratum</i>		0.09	0.07
Chenopodium sp. #1	<i>Chenopodium</i> sp.		0.52	0.15
clammy groundcherry	<i>Physalis heterophylla</i>		0.05	0.05
common sunflower	<i>Helianthus annuus</i>		0.75	0.18
conyza	<i>Conyza canadensis</i>		5.07	0.40
cutleaf daisy	<i>Erigeron compositus</i>		0.47	0.15
ironplant goldenweed	<i>Haplopappus spinulosus</i>		0.89	0.20
Dalea sp. #1	<i>Dalea</i> sp.		0.05	0.05
Engelmanns daisy	<i>Engelmannia pinnatifida</i>		0.33	0.12
evening primrose	<i>Oenothera</i> spp.		0.42	0.14
fame flower	<i>Talinum parviflorum</i>		0.14	0.08
flatspine stickseed	<i>Lappula echinata</i> var. <i>occidentalis</i>		0.14	0.08
flaxflowered ipomopsis	<i>Ipomopsis longiflora</i>		1.78	0.27
frog fruit	<i>Lippia cuneifolia</i>		0.19	0.09
Hopi tea greenthread	<i>Thelesperma megapotamicum</i>		0.05	0.05
Hymenopappus sp.	<i>Hymenopappus</i> sp.		0.66	0.17
lambquarters	<i>Chenopodium album</i>		0.19	0.09
narrowleaf fourclock	<i>Mirabilis linearis</i>		0.14	0.08
narrowleaf stoneseed	<i>Lithospermum incisum</i>		0.23	0.10

pepperpod mustard	<i>Lepidium densiflorum</i>		6.29	0.41
prairie groundcherry	<i>Physalis pumila</i>		0.23	0.10
prickly poppy	<i>Argemone polyanthemus</i>		0.05	0.05
rush skeletonplant	<i>Lygodesmia juncea</i>		0.14	0.08
scarlet gaura	<i>Gaura coccinea</i>		1.31	0.24
slimflower scurfpea	<i>Psoraleidum tenuiflorum</i>		0.52	0.15
small lupine	<i>Lupinus pusillus</i>		0.09	0.07
stickleaf mentzilia	<i>Mentzelia decapetala</i>		0.14	0.08
velvet gaura	<i>Gaura parviflora</i>		0.05	0.05
wallflower	<i>Erysimum asperum</i>		0.05	0.05
wavyleaf thistle	<i>Cirsium undulatum</i>		0.19	0.09
western fleabane	<i>Erigeron bellidialstrum</i>		0.47	0.15
winecup	<i>Callirhoe involucrata</i>		0.42	0.14
woolly Indianwheat	<i>Plantago patagonica</i>		4.79	0.39
<b>Non native forbs</b>		0	7.13	0.77
kochia	<i>Kochia scoparia</i>		2.58	0.32
prickly lettuce	<i>Lactuca serriola</i>		0.09	0.07
Russian thistle	<i>Salsola iberica</i>		4.46	0.38
<b>Unidentified forbs</b>				
UF99	<i>Brassicaceae</i>		0.05	0.05
UF20			1.27	0.23
UF24			0.05	0.05
<b>Shrubs</b>		7-15	10.65	0.64
western sandcherry	<i>Prunus pumila</i>	3-10	0.00	0.00
leadplant	<i>Amorpha canescens</i>	2-7	0.00	0.00
sand sagebrush	<i>Artemisia filifolia</i>	1-5	10.00	0.40
prairie rose	<i>Rosa arkansana</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.23	0.10
purple pincushion	<i>Escobaria vivipara var. vivipara</i>	0-1	0.00	0.00
skunkbrush sumac	<i>Rhus trilobata</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.00	0.00
spreading buckwheat	<i>Eriogonum effusum</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-5	0.42	0.14
brittle cactus	<i>Opuntia fragilis</i>		0.42	0.14

<b>Ground Cover</b>	
Type	% Cover
Plant	32.65
Litter	46.72
Bare	20.54
Rock	0.00
n	1920



**Figure 100: Sandy Bottomland Mid Seral Plant Group Composition** - This graph depicts the current plant group composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that plant group on the Ecological Site. The yellow is the current group composition.



**Figure 101: Sandy Bottomland Mid Seral Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

## Sandy Bottomland Mid Seral



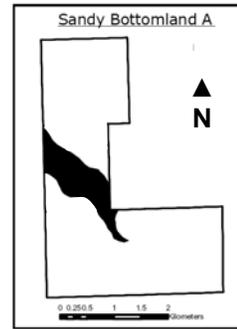
**Figure 102: Photographs of Sandy Bottomland Mid Seral** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Sandy Bottomland A

Sandy Bottomland A is southwest of Sand Creek and occupies NPS land and land owned by Cheryl J. Tonso on section 24 T17S R46W.

This area has transitioned to a **Blue Grama, Sand Sagebrush Plant Community**, a state usually reached through continuous grazing. Most dominant grasses from the HCPC were not detected, including sand bluestem, switchgrass, and yellow Indiangrass. The other dominant grass, prairie sandreed, was detected below the HCPC level at 3.95% ( $\pm 0.65$ ). The current dominant grass species were detected at 14.64% ( $\pm 0$ ) blue grama, 10.40% ( $\pm 0.67$ ) sand dropseed, 3.95% ( $\pm 0.65$ ) prairie sandreed, and 2.64% ( $\pm 0.57$ ) needleandthread. The dominant forbs from the HCPC, Pacific peavine, dotted gayfeather, narrowleaf penstemon, purple prairie clover, and silky prairie clover, were not detected. The current dominant forb species were mostly annuals and were detected at a relative abundance of 11.71% ( $\pm 0.59$ ) Russian thistle, 8.49% ( $\pm 0.73$ ) pepperpod mustard, 5.86% ( $\pm 0.72$ ) kochia, and 5.42% ( $\pm 0.71$ ) conyza. Most dominant shrubs of the HCPC were not detected, including western sandcherry and leadplant. The other dominant shrub, sand sagebrush, was detected above the HCPC level at 10.54% ( $\pm 0.66$ ). Plains pricklypear and brittle cactus were detected at suitable amounts for the HCPC at 0.15% ( $\pm 0.15$ ) and 1.02% ( $\pm 0.38$ ), respectively.

The Blue Grama, Sand Sagebrush Plant Community is stable but has lost many tallgrass species, important forbs, and shrubs. This composition can jeopardize the biotic integrity of the community. This state can also alter the nutrient/water/energy cycles and is an early stage of desertification. Although many of the dominant species of the HCPC are not found within the Sandy Bottomland A, most of the species are found within the SCMNHS. Species not found on the SCMNHS include: yellow Indiangrass, sandhill muhly, Pacific peavine, narrowleaf penstemon, silky prairie clover, western sandcherry, and leadplant. However, these species may be present on neighboring lands.



## Sandy Bottomland A

**Site Type:** Rangeland

**Site Name:** Sandy Bottomland

**Site ID:** R067BY031CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 100

**Date:** June 2005

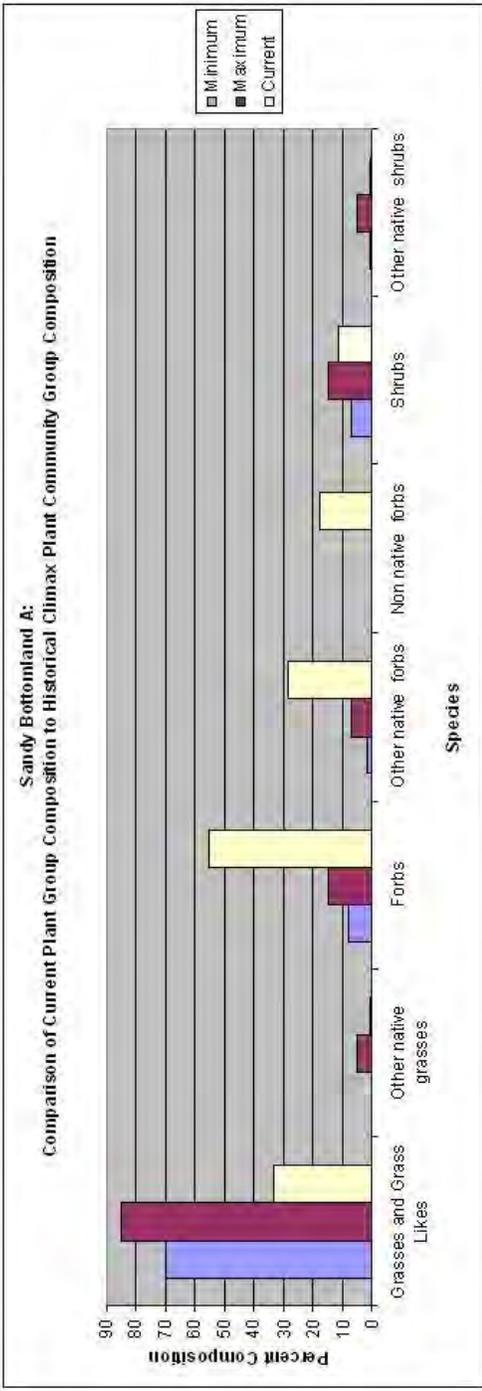
**Table 38: Sandy Bottomland A Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>		<b>70-85</b>	<b>33.38</b>	<b>3.01</b>
sand bluestem	<i>Andropogon hallii</i>	25-30	0.00	0.00
prairie sandreed	<i>Calamovilfa longifolia</i>	15-25	3.95	0.65
switchgrass	<i>Panicum virgatum</i>	10-20	0.00	0.00
yellow Indiangrass	<i>Sorghastrum nutans</i>	5-10	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	5-7	2.64	0.57
blue grama	<i>Bouteloua gracilis</i>	1-5	14.64	0.00
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.00	0.00
western wheatgrass	<i>Pascopyrum smithii</i>	1-5	0.59	0.29
Canada wildrye	<i>Elymus canadensis</i>	1-3	0.00	0.00
sand dropseed	<i>Sporobolus cryptandrus</i>	1-3	10.40	0.67
tall dropseed	<i>Sporobolus compositus var. compositus</i>	1-3	0.14	0.08
sideoats grama	<i>Bouteloua curtipendula</i>	0-3	0.00	0.00
blowout grass	<i>Redfieldia flexuosa</i>	1-2	0.00	0.00
hairy grama	<i>Bouteloua hirsuta</i>	1-2	0.00	0.00
Indian ricegrass	<i>Achnatherum hymenoides</i>	1-2	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	1-2	0.00	0.00
sand paspalum	<i>Paspalum setaceum</i>	1-2	0.00	0.00
sandhill muhly	<i>Muhlenbergia pungens</i>	1-2	0.00	0.00
inland saltgrass	<i>Distichlis spicata</i>	0-1	0.00	0.00
prairie junegrass	<i>Koeleria macrantha</i>	0-1	0.00	0.00
sixweeks fescue	<i>Vulpia octoflora</i>	0-1	0.29	0.21
thickspike wheatgrass	<i>Elymus lanceolatus ssp. lanceolatus</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
thinstem flatsedge	<i>Cyperus lupulinus</i>	0-1	0.00	0.00
<b>Other native grasses</b>		<b>0-5</b>	<b>0.73</b>	<b>0.54</b>
buffalograss	<i>Buchloe dactyloides</i>		0.44	0.25
little annual barley	<i>Hordeum pusillum</i>		0.15	0.15
windmill grass	<i>Chloris verticillata</i>		0.15	0.15
<b>Forbs</b>		<b>8-15</b>	<b>54.90</b>	<b>9.58</b>
Pacific peavine	<i>Lathyrus polymorphus</i>	1-3	0.00	0.00
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	1-2	0.00	0.00
silky prairie clover	<i>Dalea villosa</i>	1-2	0.00	0.00

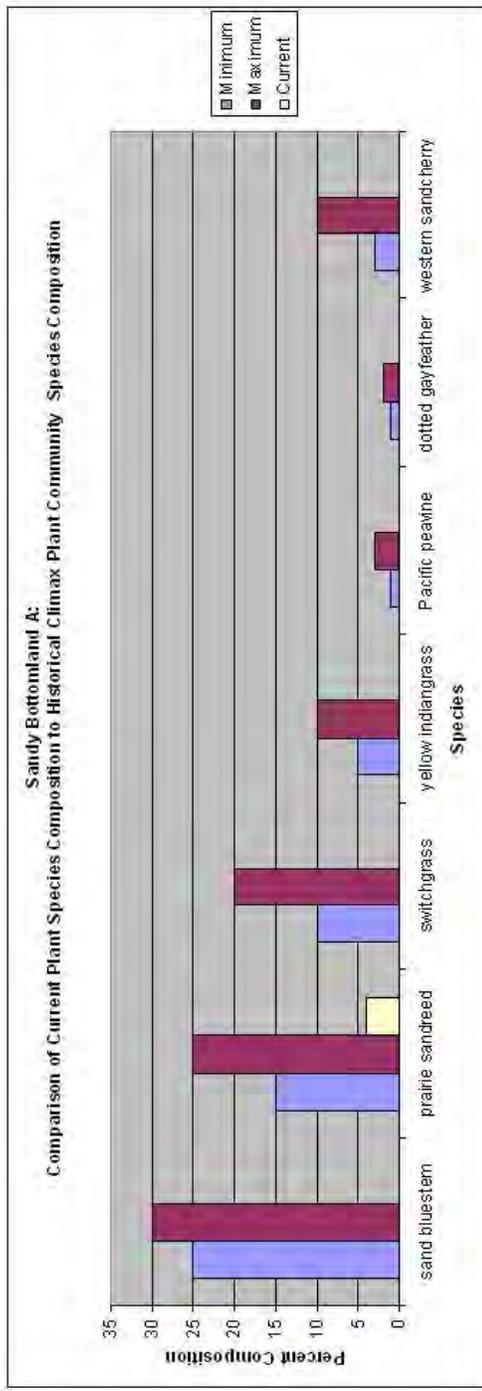
annual buckwheat	<i>Eriogonum annuum</i>	0-1	4.83	0.69
bigtop dalea	<i>Dalea enneandra</i>	0-1	0.00	0.00
bush morning glory	<i>Ipomoea leptophylla</i>	0-1	0.44	0.25
death camas	<i>Zigadenus venenosus</i>	0-1	0.00	0.00
hairy goldenaster	<i>Heterotheca villosa</i>	0-1	0.00	0.00
heath aster	<i>Symphotrichum ericoides</i>	0-1	0.15	0.15
Hoods phlox	<i>Phlox hoodii</i>	0-1	0.00	0.00
lemon scurfpea	<i>Psoraleidum lanceolatum</i>	0-1	0.00	0.00
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.59	0.29
Nuttalls evolvulus	<i>Evolvulus nuttallianus</i>	0-1	0.00	0.00
painted milkvetch	<i>Astragalus ceramicus var. filifolius</i>	0-1	0.00	0.00
pale evening-primrose	<i>Oenothera albicaulis</i>	0-1	0.00	0.00
prairie larkspur	<i>Delphinium carolinianum</i>	0-1	0.00	0.00
prairie spiderwort	<i>Tradescantia occidentalis</i>	0-1	0.15	0.15
sand lily	<i>Leucocrinum montanum</i>	0-1	0.00	0.00
scarlet globemallow	<i>Sphaeralcea coccinea</i>	0-1	2.93	0.59
snowball sand verbena	<i>Ambronia fragans</i>	0-1	0.00	0.00
stiff sunflower	<i>Helianthus pauciflorus ssp. pauciflorus</i>	0-1	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	0-1	0.00	0.00
western ragweed	<i>Ambrosia psilostachya</i>	0-1	0.00	0.00
<b>Other native forbs</b>		<b>2-7</b>	<b>28.26</b>	<b>6.16</b>
Astragalus sp.	<i>Astragalus sp.</i>		0.15	0.15
beggars tick	<i>Cryptantha circumscissa</i>		4.54	0.68
common sunflower	<i>Helianthus annuus</i>		1.61	0.46
conyza	<i>Conyza canadensis</i>		5.42	0.71
cutleaf daisy	<i>Erigeron compositus</i>		1.46	0.44
ironplant goldenweed	<i>Haplopappus spinulosus</i>		0.15	0.15
flatspine stickseed	<i>Lappula echinata var. occidentalis</i>		0.15	0.15
flaxflowered ipomopsis	<i>Ipomopsis longiflora</i>		0.88	0.35
Hymenopappus sp.	<i>Hymenopappus sp.</i>		0.29	0.21
lambquarters	<i>Chenopodium album</i>		0.15	0.15
narrowleaf stoneseed	<i>Lithospermum incisum</i>		0.29	0.21
pepperpod mustard	<i>Lepidium densiflorum</i>		8.49	0.73
rush skeletonplant	<i>Lygodesmia juncea</i>		0.15	0.15
scarlet gaura	<i>Gaura coccinea</i>		1.02	0.38
slimflower scurfpea	<i>Psoraleidum tenuiflorum</i>		0.15	0.15
stickleaf mentzilia	<i>Mentzelia decapetala</i>		0.15	0.15
wavyleaf thistle	<i>Cirsium undulatum</i>		0.29	0.21
winecup	<i>Callirhoe involucrata</i>		0.29	0.21
woolly Indianwheat	<i>Plantago patagonica</i>		2.64	0.57
<b>Non native forbs</b>		<b>0</b>	<b>17.57</b>	<b>1.31</b>
kochia	<i>Kochia scoparia</i>		5.86	0.72
Russian thistle	<i>Salsola iberica</i>		11.71	0.59
<b>Unidentified forbs</b>				
UF99	<i>Brassicaceae</i>		0.15	0.15
<b>Shrubs</b>		<b>7-15</b>	<b>11.71</b>	<b>1.18</b>
western sandcherry	<i>Prunus pumila</i>	3-10	0.00	0.00
leadplant	<i>Amorpha canescens</i>	2-7	0.00	0.00
sand sagebrush	<i>Artemisia filifolia</i>	1-5	10.54	0.66

prairie rose	<i>Rosa arkansana</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.15	0.15
purple pincushion	<i>Escobaria vivipara var. vivipara</i>	0-1	0.00	0.00
skunkbrush sumac	<i>Rhus trilobata</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.00	0.00
spreading buckwheat	<i>Eriogonum effusum</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-5	1.02	0.38
brittle cactus	<i>Opuntia fragilis</i>		1.02	0.38

<b>Ground Cover</b>	
Type	% Cover
Plant	25.67
Litter	48.50
Bare	25.33
Rock	0.00
n	600



**Figure 104: Sandy Bottomland A Plant Group Composition** - This graph depicts the current plant group composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that plant group on the Ecological Site. The yellow is the current group composition.



**Figure 103: Sandy Bottomland A Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

## Sandy Bottomland A



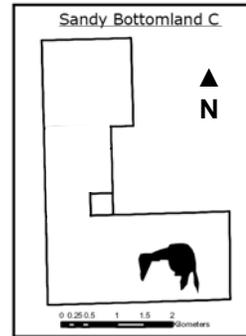
**Figure 105: Photographs of Sandy Bottomland A** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Sandy Bottomland C

The Sandy Bottomland C stratum is located on south portion of the property. Sandy Bottomland C is south of Sand Creek and occupies NPS land on section 30 T17S R45W.

This area has transitioned to a **Blue Grama, Sand Sagebrush Plant Community**, a state usually reached through continuous grazing. Two dominant grasses from the HCPC, switchgrass and yellow Indiangrass, were not detected. The other dominant grasses, sand bluestem and prairie sandreed, were detected below HCPC levels at 0.69% ( $\pm 0.39$ ) and 3.21% ( $\pm 0.76$ ), respectively. The current dominant grass species were detected at 13.53% ( $\pm 0.23$ ) blue grama, 11.24% ( $\pm 0.69$ ) sand dropseed, 8.94% ( $\pm 0.85$ ) sixweeks fescue, 6.88% ( $\pm 0.57$ ) needleandthread, and 3.21% ( $\pm 0.76$ ) prairie sandreed. The dominant forbs from the HCPC, Pacific peavine, dotted gayfeather, narrowleaf penstemon, purple prairie clover, and silky prairie clover, were not detected. The current dominant forb species were detected at a relative abundance of 5.28% ( $\pm 0.87$ ) scarlet globemallow, 4.59% ( $\pm 0.84$ ) pepperpod mustard, 4.13% ( $\pm 0.82$ ) woolly Indianwheat, and 3.67% ( $\pm 0.79$ ) conyza. Most dominant shrubs of the HCPC were not detected, including western sandcherry and leadplant. The other dominant shrub sand sagebrush was detected above the HCPC level at 10.54% ( $\pm 0.66$ ). Plains pricklypear was detected at a suitable amount for the HCPC at 0.69% ( $\pm 0.39$ ).

The Blue Grama, Sand Sagebrush Plant Community is stable but has lost many tallgrass species, important forbs, and shrubs. This composition can jeopardize the biotic integrity of the community. This state can also alter the nutrient/water/energy cycles and is an early stage of desertification. Although many of the dominant species of the HCPC are not found within the Sandy Bottomland C stratum, most of the species are found within the SCMNHs. Species not found on the SCMNHs include: yellow Indiangrass, sandhill muhly, Pacific peavine, narrowleaf penstemon, silky prairie clover, western sandcherry, and leadplant. However, these species may be present on neighboring lands.



## Sandy Bottomland C

**Site Type:** Rangeland

**Site Name:** Sandy Bottomland

**Site ID:** R067BY031CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 60

**Date:** June 2005

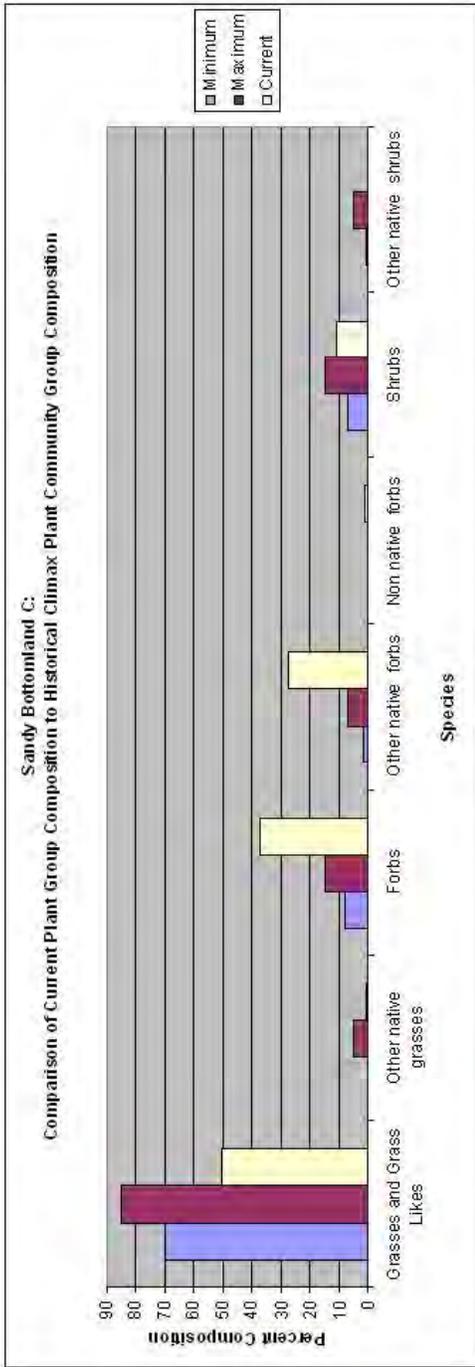
**Table 39: Sandy Bottomland C Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>		70-85	50.23	6.67
sand bluestem	<i>Andropogon hallii</i>	25-30	0.69	0.39
prairie sandreed	<i>Calamovilfa longifolia</i>	15-25	3.21	0.76
switchgrass	<i>Panicum virgatum</i>	10-20	0.00	0.00
yellow Indiangrass	<i>Sorghastrum nutans</i>	5-10	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	5-7	6.88	0.90
blue grama	<i>Bouteloua gracilis</i>	1-5	13.53	0.23
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.00	0.00
western wheatgrass	<i>Pascopyrum smithii</i>	1-5	1.61	0.58
Canada wildrye	<i>Elymus canadensis</i>	1-3	0.00	0.00
sand dropseed	<i>Sporobolus cryptandrus</i>	1-3	11.24	0.69
tall dropseed	<i>Sporobolus compositus var. compositus</i>	1-3	0.69	0.39
sideoats grama	<i>Bouteloua curtipendula</i>	0-3	0.00	0.00
blowout grass	<i>Redfieldia flexuosa</i>	1-2	0.00	0.00
hairy grama	<i>Bouteloua hirsuta</i>	1-2	0.23	0.23
Indian ricegrass	<i>Achnatherum hymenoides</i>	1-2	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	1-2	0.23	0.23
sand paspalum	<i>Paspalum setaceum</i>	1-2	0.00	0.00
sandhill muhly	<i>Muhlenbergia pungens</i>	1-2	0.00	0.00
inland saltgrass	<i>Distichlis spicata</i>	0-1	2.06	0.64
prairie junegrass	<i>Koeleria macrantha</i>	0-1	0.00	0.00
sixweeks fescue	<i>Vulpia octoflora</i>	0-1	8.94	0.85
thickspike wheatgrass	<i>Elymus lanceolatus ssp. lanceolatus</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
thinstem flatsedge	<i>Cyperus lupulinus</i>	0-1	0.00	0.00
<b>Other native grasses</b>		0-5	0.92	0.78
alkali sacaton	<i>Sporobolus airoides</i>		0.23	0.23
buffalograss	<i>Buchloe dactyloides</i>		0.23	0.23
bottlebrush squirreltail	<i>Elymus elymoides</i>		0.46	0.32
<b>Forbs</b>		8-15	37.16	11.26
Pacific peavine	<i>Lathyrus polymorphus</i>	1-3	0.00	0.00
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	1-2	0.00	0.00
silky prairie clover	<i>Dalea villosa</i>	1-2	0.00	0.00

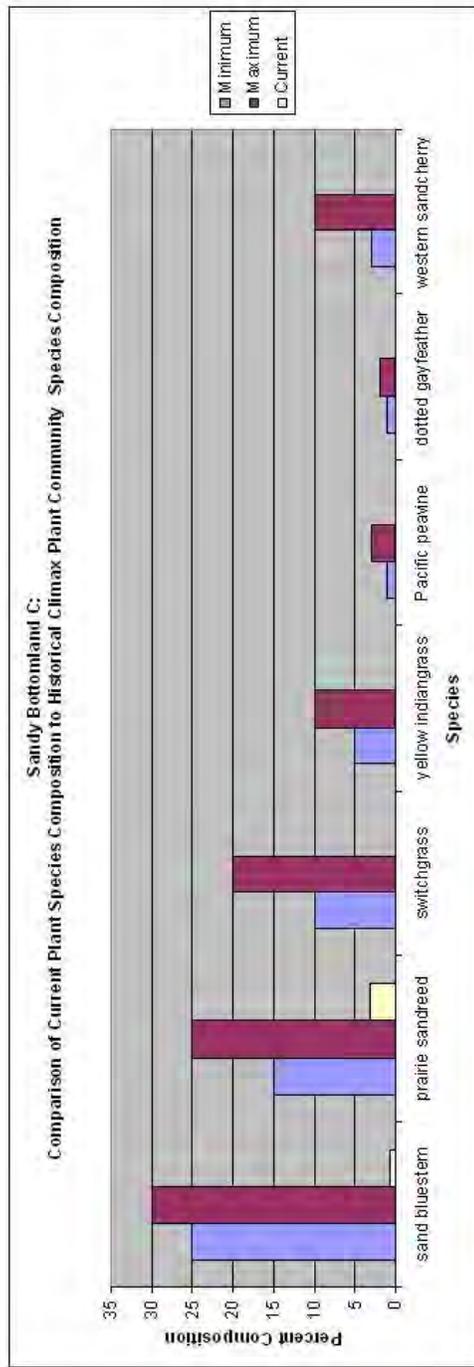
annual buckwheat	<i>Eriogonum annuum</i>	0-1	0.92	0.45
bigtop dalea	<i>Dalea enneandra</i>	0-1	0.00	0.00
bush morning glory	<i>Ipomoea leptophylla</i>	0-1	0.23	0.23
death camas	<i>Zigadenus venenosus</i>	0-1	0.00	0.00
hairy goldenaster	<i>Heterotheca villosa</i>	0-1	0.00	0.00
heath aster	<i>Symphotrichum ericoides</i>	0-1	0.00	0.00
Hoods phlox	<i>Phlox hoodii</i>	0-1	0.00	0.00
lemon scurfpea	<i>Psoralegium lanceolatum</i>	0-1	0.00	0.00
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.00	0.00
Nuttalls evolulus	<i>Evolvulus nuttallianus</i>	0-1	1.61	0.58
painted milkvetch	<i>Astragalus ceramicus var. filifolius</i>	0-1	0.00	0.00
pale evening-primrose	<i>Oenothera albicaulis</i>	0-1	0.00	0.00
prairie larkspur	<i>Delphinium carolinianum</i>	0-1	0.00	0.00
prairie spiderwort	<i>Tradescantia occidentalis</i>	0-1	0.00	0.00
sand lily	<i>Leucocrinum montanum</i>	0-1	0.00	0.00
scarlet globemallow	<i>Sphaeralcea coccinea</i>	0-1	5.28	0.87
snowball sand verbena	<i>Ambronia fragans</i>	0-1	0.00	0.00
stiff sunflower	<i>Helianthus pauciflorus ssp. pauciflorus</i>	0-1	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	0-1	0.23	0.23
western ragweed	<i>Ambrosia psilostachya</i>	0-1	0.00	0.00
<b>Other native forbs</b>		<b>2-7</b>	<b>27.29</b>	<b>8.14</b>
beggars tick	<i>Cryptantha circumscissa</i>		3.21	0.76
flatspine stickseed	<i>Lappula echinata var. occidentalis</i>		0.46	0.32
buffalo bur	<i>Solanum rostratum</i>		0.46	0.32
cutleaf daisy	<i>Erigeron compositus</i>		0.00	0.00
ironplant goldenweed	<i>Haplopappus spinulosus</i>		2.52	0.69
Hymenopappus sp.	<i>Hymenopappus sp.</i>		0.69	0.39
lambquarters	<i>Chenopodium album</i>		0.46	0.32
narrowleaf fourclock	<i>Mirabilis linearis</i>		0.69	0.39
pepperpod mustard	<i>Lepidium densiflorum</i>		4.59	0.84
scarlet gaura	<i>Gaura coccinea</i>		2.52	0.69
slimflower scurfpea	<i>Psoralegium tenuiflorum</i>		0.23	0.23
flaxflowered ipomopsis	<i>Ipomopsis longiflora</i>		2.52	0.69
fame flower	<i>Talinum parviflorum</i>		0.46	0.32
wavyleaf thistle	<i>Cirsium undulatum</i>		0.23	0.23
conyza	<i>Conyza canadensis</i>		3.67	0.79
winecup	<i>Callirhoe involucrata</i>		0.46	0.32
woolly Indianwheat	<i>Plantago patagonica</i>		4.13	0.82
<b>Non native forbs</b>		<b>0</b>	<b>1.61</b>	<b>0.77</b>
prickly lettuce	<i>Lactuca serriola</i>		0.23	0.23
Russian thistle	<i>Salsola iberica</i>		1.38	0.54
<b>Unidentified forbs</b>				
UF20			1.83	0.61
<b>Shrubs</b>		<b>7-15</b>	<b>10.78</b>	<b>1.18</b>
western sandcherry	<i>Prunus pumila</i>	3-10	0.00	0.00
leadplant	<i>Amorpha canescens</i>	2-7	0.00	0.00
sand sagebrush	<i>Artemisia filifolia</i>	1-5	10.09	0.79
prairie rose	<i>Rosa arkansana</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.69	0.39

purple pincushion	<i>Escobaria vivipara var. vivipara</i>	0-1	0.00	0.00
skunkbrush sumac	<i>Rhus trilobata</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.00	0.00
spreading buckwheat	<i>Eriogonum effusum</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-5	0.00	0.00

<b>Ground Cover</b>	
Type	% Cover
Plant	43.06
Litter	46.67
Bare	10.28
Rock	0.00
n	360



**Figure 107: Sandy Bottomland C Plant Group Composition** - This graph depicts the current plant group composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that plant group on the Ecological Site. The yellow is the current group composition.



**Figure 106: Sandy Bottomland C Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

### Sandy Bottomland C



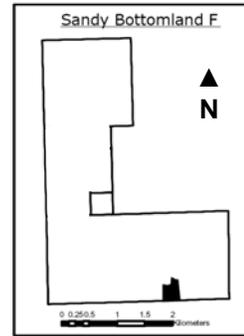
**Figure 108: Photographs of Sandy Bottomland C** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Sandy Bottomland F

The Sandy Bottomland F stratum is located on south portion of the property. Sandy Bottomland F is south of Sand Creek and occupies NPS land on section 30 T17S R45W.

This area has transitioned to a **Blue Grama, Sand Sagebrush Plant Community**, a state usually reached through continuous grazing. The dominant grasses from the HCPC, sand bluestem, switchgrass, yellow Indiangrass, and little bluestem, were not detected. The current dominant grass species were detected at 15.34% ( $\pm 0.37$ ) blue grama, 7.14% ( $\pm 1.03$ ) sand dropseed, 2.38% ( $\pm 0.74$ ) red threeawn, and 2.38% ( $\pm 0.74$ ) buffalograss. The dominant forbs from the HCPC, Pacific peavine, dotted gayfeather, narrowleaf penstemon, purple prairie clover, and silky prairie clover, were not detected. The current dominant forb species were detected at a relative abundance of 10.32% ( $\pm 0.99$ ) woolly Indianwheat, 8.47% ( $\pm 1.03$ ) pepperpod mustard, 6.88% ( $\pm 1.02$ ) conyza, and 5.56% ( $\pm 0.99$ ) flaxflowered ipomopsis. Most dominant shrubs of the HCPC were not detected, including western sandcherry and leadplant. The other dominant shrub, sand sagebrush, was detected above the HCPC level at 8.99% ( $\pm 1.02$ ).

The Blue Grama, Sand Sagebrush Plant Community is stable but has lost many tallgrass species, important forbs, and shrubs. This composition can jeopardize the biotic integrity of the community. This state can also alter the nutrient/water/energy cycles and is an early stage of desertification. Although many of the dominant species of the HCPC are not found within the Sandy Bottomland F stratum, most of the species are found within the SCMNHs. Species not found on the SCMNHs include: yellow Indiangrass, sandhill muhly, Pacific peavine, narrowleaf penstemon, silky prairie clover, western sandcherry, and leadplant. However, these species may be present on neighboring lands.



## Sandy Bottomland F

**Site Type:** Rangeland

**Site Name:** Sandy Bottomland

**Site ID:** R067BY031CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 60

**Date:** June 2005

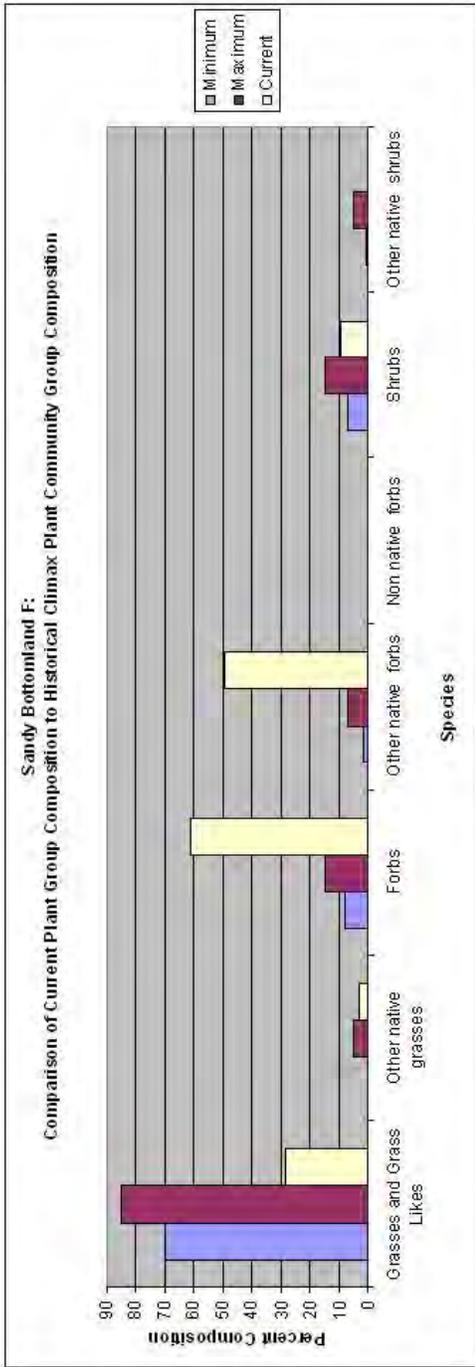
**Table 40: Sandy Bottomland F Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>		<b>70-85</b>	<b>37.50</b>	<b>5.34</b>
sand bluestem	<i>Andropogon hallii</i>	25-30	0.00	0.00
prairie sandreed	<i>Calamovilfa longifolia</i>	15-25	0.00	0.00
switchgrass	<i>Panicum virgatum</i>	10-20	0.00	0.00
yellow Indiangrass	<i>Sorghastrum nutans</i>	5-10	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	5-7	4.23	0.75
blue grama	<i>Bouteloua gracilis</i>	1-5	4.44	0.76
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.00	0.00
western wheatgrass	<i>Pascopyrum smithii</i>	1-5	0.00	0.00
Canada wildrye	<i>Elymus canadensis</i>	1-3	0.00	0.00
sand dropseed	<i>Sporobolus cryptandrus</i>	1-3	11.49	0.34
tall dropseed	<i>Sporobolus compositus var. compositus</i>	1-3	0.00	0.00
sideoats grama	<i>Bouteloua curtipendula</i>	0-3	0.00	0.00
blowout grass	<i>Redfieldia flexuosa</i>	1-2	0.00	0.00
hairy grama	<i>Bouteloua hirsuta</i>	1-2	0.00	0.00
Indian ricegrass	<i>Achnatherum hymenoides</i>	1-2	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	1-2	7.66	0.76
sand paspalum	<i>Paspalum setaceum</i>	1-2	0.00	0.00
sandhill muhly	<i>Muhlenbergia pungens</i>	1-2	0.00	0.00
inland saltgrass	<i>Distichlis spicata</i>	0-1	1.41	0.51
prairie junegrass	<i>Koeleria macrantha</i>	0-1	0.00	0.00
sixweeks fescue	<i>Vulpia octoflora</i>	0-1	3.83	0.73
thickspike wheatgrass	<i>Elymus lanceolatus ssp. lanceolatus</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
thinstem flatsedge	<i>Cyperus lupulinus</i>	0-1	0.00	0.00
<b>Other native grasses</b>		<b>0-5</b>	<b>4.44</b>	<b>1.49</b>
bottlebrush squirreltail	<i>Elymus elymoides</i>		1.81	0.56
buffalograss	<i>Buchloe dactyloides</i>		0.60	0.34
tumblegrass	<i>Schedonnardus paniculatus</i>		2.02	0.59
<b>Forbs</b>		<b>8-15</b>	<b>52.42</b>	<b>13.63</b>
Pacific peavine	<i>Lathyrus polymorphus</i>	1-3	0.00	0.00
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	1-2	0.00	0.00
silky prairie clover	<i>Dalea villosa</i>	1-2	0.00	0.00

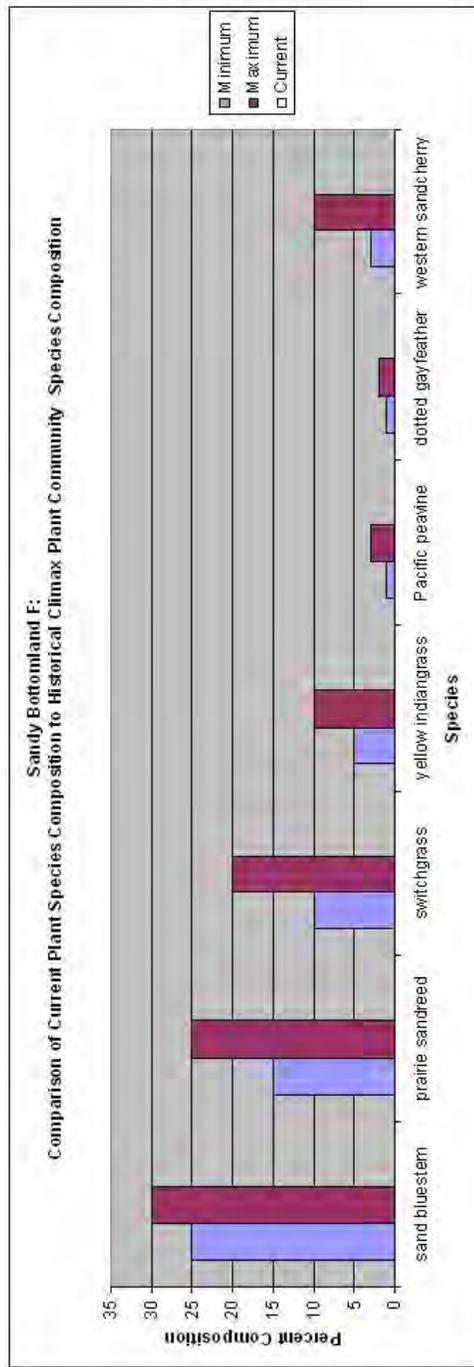
annual buckwheat	<i>Eriogonum annuum</i>	0-1	1.21	0.47
bigtop dalea	<i>Dalea enneandra</i>	0-1	0.20	0.20
bush morning glory	<i>Ipomoea leptophylla</i>	0-1	0.00	0.00
death camas	<i>Zigadenus venenosus</i>	0-1	0.00	0.00
hairy goldenaster	<i>Heterotheca villosa</i>	0-1	2.02	0.59
heath aster	<i>Symphotrichum ericoides</i>	0-1	0.40	0.28
Hoods phlox	<i>Phlox hoodii</i>	0-1	0.00	0.00
lemon scurfpea	<i>Psoraleidium lanceolatum</i>	0-1	0.00	0.00
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.40	0.28
Nuttalls evolvulus	<i>Evolvulus nuttallianus</i>	0-1	2.02	0.59
painted milkvetch	<i>Astragalus ceramicus var. filifolius</i>	0-1	0.00	0.00
pale evening-primrose	<i>Oenothera albicaulis</i>	0-1	0.00	0.00
prairie larkspur	<i>Delphinium carolinianum</i>	0-1	0.00	0.00
prairie spiderwort	<i>Tradescantia occidentalis</i>	0-1	0.00	0.00
sand lily	<i>Leucocrinum montanum</i>	0-1	0.00	0.00
scarlet globemallow	<i>Sphaeralcea coccinea</i>	0-1	5.44	0.78
snowball sand verbena	<i>Ambronia fragans</i>	0-1	0.00	0.00
stiff sunflower	<i>Helianthus pauciflorus ssp. pauciflorus</i>	0-1	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	0-1	2.22	0.61
western ragweed	<i>Ambrosia psilostachya</i>	0-1	1.81	0.56
<b>Other native forbs</b>		2-7	36.69	9.26
beggars tick	<i>Cryptantha circumscissa</i>		5.44	0.78
blanket flower	<i>Gaillardia pulchella</i>		0.81	0.39
clammy groundcherry	<i>Physalis heterophylla</i>		0.40	0.28
common sunflower	<i>Helianthus annuus</i>		0.60	0.34
conyza	<i>Conyza canadensis</i>		6.65	0.78
ironplant goldenweed	<i>Haplopappus spinulosus</i>		1.41	0.51
evening primrose	<i>Oenothera sp.</i>		3.63	0.72
flaxflowered ipomopsis	<i>Ipomopsis longiflora</i>		1.01	0.44
groundsel	<i>Senecio integerrimus</i>		0.40	0.28
Hymenopappus sp.	<i>Hymenopappus sp.</i>		0.20	0.20
narrowleaf fourclock	<i>Mirabilis linearis</i>		1.21	0.47
narrowleaf stoneseed	<i>Lithospermum incisum</i>		0.60	0.34
palmleaf scurfpea	<i>Psoralea digitata</i>		0.20	0.20
pepperpod mustard	<i>Lepidium densiflorum</i>		4.44	0.76
prairie groundcherry	<i>Physalis pumila</i>		0.40	0.28
scarlet gaura	<i>Gaura coccinea</i>		1.81	0.56
wallflower	<i>Erysimum asperum</i>		0.20	0.20
wavyleaf thistle	<i>Cirsium undulatum</i>		0.40	0.28
western fleabane	<i>Erigeron bellidiastrum</i>		1.01	0.44
woolly locoweed	<i>Astragalus mollissimus</i>		0.20	0.20
woolly Indianwheat	<i>Plantago patagonica</i>		5.65	0.79
<b>Unidentified forbs</b>				
UF20			0.20	0.20
<b>Shrubs</b>		7-15	9.88	1.01
western sandcherry	<i>Prunus pumila</i>	3-10	0.00	0.00
leadplant	<i>Amorpha canescens</i>	2-7	0.00	0.00
sand sagebrush	<i>Artemisia filifolia</i>	1-5	9.27	0.67
prairie rose	<i>Rosa arkansana</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.60	0.34

purple pincushion	<i>Escobaria vivipara var. vivipara</i>	0-1	0.00	0.00
skunkbrush sumac	<i>Rhus trilobata</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.00	0.00
spreading buckwheat	<i>Eriogonum effusum</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-5	0.00	0.00

<b>Ground Cover</b>	
Type	% Cover
Plant	33.89
Litter	48.61
Bare	17.50
Rock	0.00
n	360



**Figure 110: Sandy Bottomland F Plant Group Composition** - This graph depicts the current plant group composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that plant group on the Ecological Site. The yellow is the current group composition.



**Figure 109: Sandy Bottomland F Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

### Sandy Bottomland F



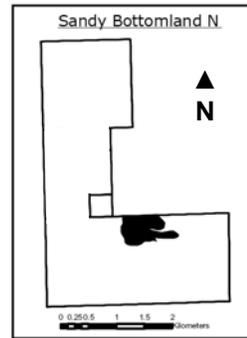
**Figure 111: Photographs of Sandy Bottomland F** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Sandy Bottomland N

The Sandy Bottomland N stratum is located on south portion of the property. Sandy Bottomland N is north of Sand Creek and occupies NPS land on sections 25 T17S R46W and 30 T17S R45W.

This area has transitioned to a **Blue Grama, Sand Sagebrush Plant Community**, a state usually reached through continuous grazing. Most dominant grasses from the HCPC were not detected, including sand bluestem, switchgrass, and yellow Indiangrass. The other dominant grass, prairie sandreed, was detected below the HCPC level at 0.63% ( $\pm 0.31$ ). The current dominant grass species were detected at 13.25% ( $\pm 0.58$ ) blue grama, 11.67% ( $\pm 0.70$ ) sand dropseed, 4.57% ( $\pm 0.72$ ) sixweeks fescue, and 4.42% ( $\pm 0.71$ ) red threeawn. The dominant forbs from the HCPC, Pacific peavine, dotted gayfeather, narrowleaf penstemon, purple prairie clover, and silky prairie clover, were not detected. The current dominant forb species were detected at a relative abundance of 4.57% ( $\pm 0.72$ ) conyza, 4.26% ( $\pm 0.70$ ) woolly Indianwheat, 4.10% ( $\pm 0.70$ ) beggars tick, and 3.79% ( $\pm 0.68$ ) pepperpod mustard. Most dominant shrubs of the HCPC were not detected, including western sandcherry and leadplant. The other dominant shrub, sand sagebrush, was detected above the HCPC level at 9.94% ( $\pm 0.77$ ).

The Blue Grama, Sand Sagebrush Plant Community is stable but has lost many tallgrass species, important forbs, and shrubs. This composition can jeopardize the biotic integrity of the community. This state can also alter the nutrient/water/energy cycles and is an early stage of desertification. Although many of the dominant species of the HCPC are not found within the Sandy Bottomland N stratum, most of the species are found within the SCMNHS. Species not found on the SCMNHS include: yellow Indiangrass, sandhill muhly, Pacific peavine, narrowleaf penstemon, silky prairie clover, western sandcherry, and leadplant. However, these species may be present on neighboring lands.



## Sandy Bottomland N

**Site Type:** Rangeland

**Site Name:** Sandy Bottomland

**Site ID:** R067BY031CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 100

**Date:** June 2005

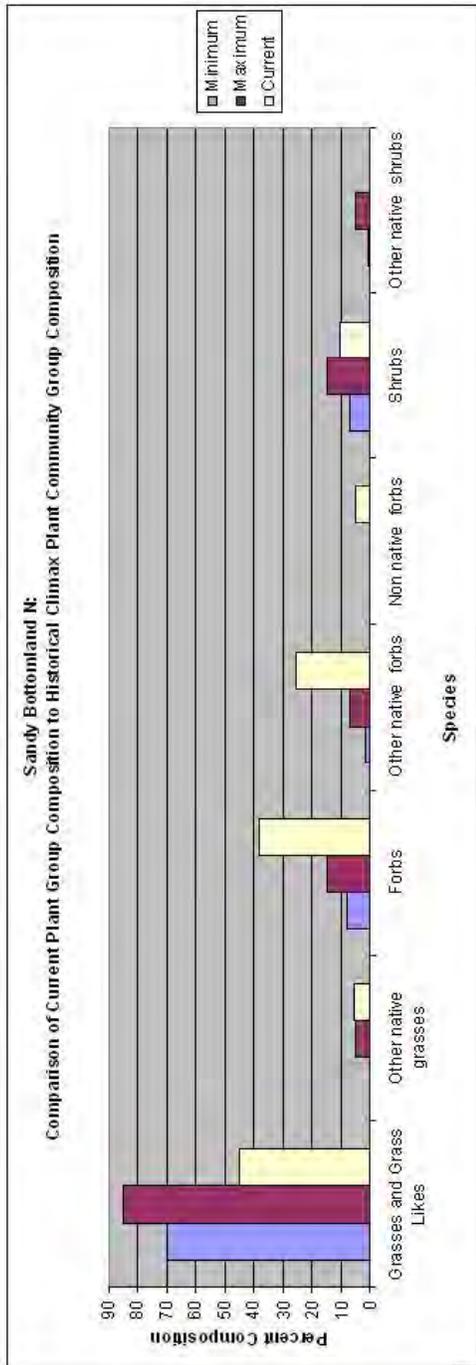
**Table 41: Sandy Bottomland N Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>		<b>70-85</b>	<b>45.43</b>	<b>6.03</b>
sand bluestem	<i>Andropogon hallii</i>	25-30	0.00	0.00
prairie sandreed	<i>Calamovilfa longifolia</i>	15-25	0.63	0.31
switchgrass	<i>Panicum virgatum</i>	10-20	0.00	0.00
yellow Indiangrass	<i>Sorghastrum nutans</i>	5-10	0.00	0.00
needleandthread	<i>Hesperostipa comata</i>	5-7	0.47	0.27
blue grama	<i>Bouteloua gracilis</i>	1-5	13.25	0.58
little bluestem	<i>Schizachyrium scoparium</i>	1-5	0.00	0.00
western wheatgrass	<i>Pascopyrum smithii</i>	1-5	0.95	0.38
Canada wildrye	<i>Elymus canadensis</i>	1-3	0.00	0.00
sand dropseed	<i>Sporobolus cryptandrus</i>	1-3	11.67	0.70
tall dropseed	<i>Sporobolus compositus var. compositus</i>	1-3	0.00	0.00
sideoats grama	<i>Bouteloua curtipendula</i>	0-3	0.00	0.00
blowout grass	<i>Redfieldia flexuosa</i>	1-2	0.00	0.00
hairy grama	<i>Bouteloua hirsuta</i>	1-2	0.00	0.00
Indian ricegrass	<i>Achnatherum hymenoides</i>	1-2	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	1-2	4.42	0.71
sand paspalum	<i>Paspalum setaceum</i>	1-2	0.00	0.00
sandhill muhly	<i>Muhlenbergia pungens</i>	1-2	0.00	0.00
inland saltgrass	<i>Distichlis spicata</i>	0-1	3.79	0.68
prairie junegrass	<i>Koeleria macrantha</i>	0-1	0.00	0.00
sixweeks fescue	<i>Vulpia octoflora</i>	0-1	4.57	0.72
thickspike wheatgrass	<i>Elymus lanceolatus ssp. lanceolatus</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
thinstem flatsedge	<i>Cyperus lupulinus</i>	0-1	0.00	0.00
<b>Other native grasses</b>		<b>0-5</b>	<b>5.68</b>	<b>1.68</b>
bottlebrush squirreltail	<i>Elymus elymoides</i>		0.79	0.35
buffalograss	<i>Buchloe dactyloides</i>		2.21	0.55
ring muhly	<i>Muhlenbergia torreyi</i>		2.37	0.57
tumblegrass	<i>Schedonnardus paniculatus</i>		0.32	0.22
<b>Forbs</b>		<b>8-15</b>	<b>38.01</b>	<b>11.15</b>
Pacific peavine	<i>Lathyrus polymorphus</i>	1-3	0.00	0.00
dotted gayfeather	<i>Liatris punctata</i>	1-2	0.00	0.00
narrowleaf penstemon	<i>Penstemon angustifolius</i>	1-2	0.00	0.00
purple prairie clover	<i>Dalea purpurea</i>	1-2	0.00	0.00

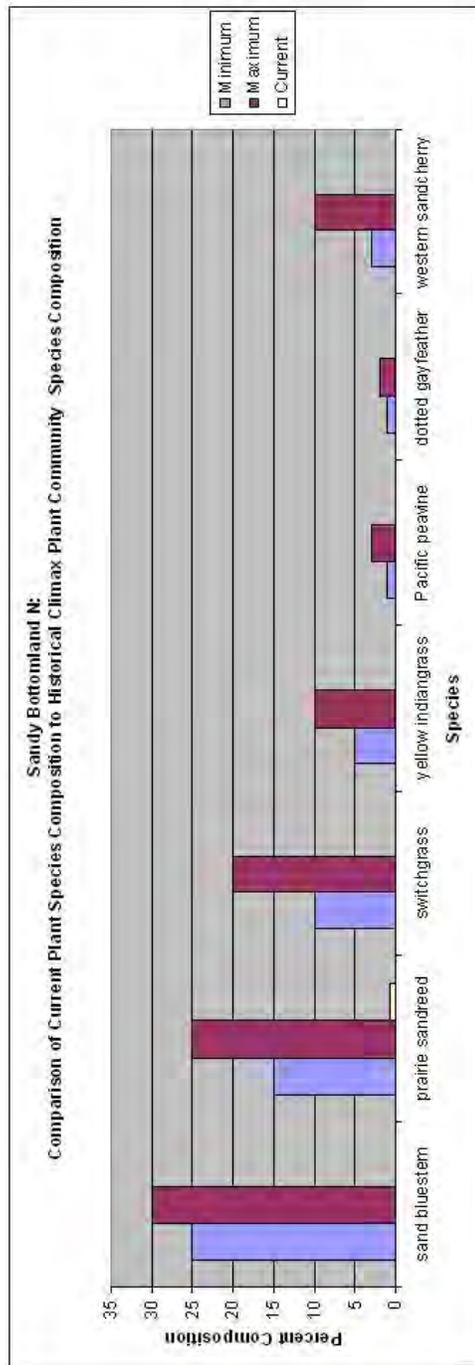
silky prairie clover	<i>Dalea villosa</i>	1-2	0.00	0.00
annual buckwheat	<i>Eriogonum annuum</i>	0-1	1.74	0.50
bigtop dalea	<i>Dalea enneandra</i>	0-1	0.00	0.00
bush morning glory	<i>Ipomoea leptophylla</i>	0-1	0.16	0.16
death camas	<i>Zigadenus venenosus</i>	0-1	0.00	0.00
hairy goldenaster	<i>Heterotheca villosa</i>	0-1	1.26	0.43
heath aster	<i>Symphotrichum ericoides</i>	0-1	0.16	0.16
Hoods phlox	<i>Phlox hoodii</i>	0-1	0.00	0.00
lemon scurfpea	<i>Psoralidium lanceolatum</i>	0-1	0.32	0.22
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	1.26	0.43
Nuttalls evolvulus	<i>Evolvulus nuttallianus</i>	0-1	0.00	0.00
painted milkvetch	<i>Astragalus ceramicus var. filifolius</i>	0-1	0.00	0.00
pale evening-primrose	<i>Oenothera albicaulis</i>	0-1	0.00	0.00
prairie larkspur	<i>Delphinium carolinianum</i>	0-1	0.00	0.00
prairie spiderwort	<i>Tradescantia occidentalis</i>	0-1	0.00	0.00
sand lily	<i>Leucocrocinum montanum</i>	0-1	0.00	0.00
scarlet globemallow	<i>Sphaeralcea coccinea</i>	0-1	2.68	0.60
snowball sand verbena	<i>Abronia fragrans</i>	0-1	0.16	0.16
stiff sunflower	<i>Helianthus pauciflorus ssp. pauciflorus</i>	0-1	0.00	0.00
upright prairie coneflower	<i>Ratibida columnifera</i>	0-1	3.47	0.66
western ragweed	<i>Ambrosia psilostachya</i>	0-1	1.10	0.40
<b>Other native forbs</b>		<b>2-7</b>	<b>25.71</b>	<b>7.44</b>
American licorice	<i>Glycyrrhiza lepidota</i>		0.16	0.16
Astragalus sp. #2	<i>Astragalus sp.</i>		0.00	0.00
beggars tick	<i>Cryptantha circumscissa</i>		4.10	0.70
Chenopodium sp. #1	<i>Chenopodium sp.</i>		1.26	0.43
common sunflower	<i>Helianthus annuus</i>		0.16	0.16
conyza	<i>Conyza canadensis</i>		4.57	0.72
ironplant goldenweed	<i>Haplopappus spinulosus</i>		0.47	0.27
evening primrose	<i>Oenothera sp.</i>		1.26	0.43
frog fruit	<i>Lippia cuneifolia</i>		0.63	0.31
narrowleaf stoneseed	<i>Lithospermum incisum</i>		0.47	0.27
pepperpod mustard	<i>Lepidium densiflorum</i>		3.79	0.68
prairie groundcherry	<i>Physalis pumila</i>		0.32	0.22
prickly poppy	<i>Argemone polyanthemosa</i>		0.16	0.16
scarlet gaura	<i>Gaura coccinea</i>		0.95	0.38
slimflower scurfpea	<i>Psoralidium tenuiflorum</i>		0.47	0.27
small lupine	<i>Lupinus pusillus</i>		0.32	0.22
stickleaf mentzilia	<i>Mentzelia decapetala</i>		0.32	0.22
velvet gaura	<i>Gaura parviflora</i>		0.16	0.16
wallflower	<i>Erysimum asperum</i>		0.16	0.16
wavyleaf thistle	<i>Cirsium undulatum</i>		0.16	0.16
western fleabane	<i>Erigeron bellidistrum</i>		1.10	0.40
winecup	<i>Callirhoe involucrata</i>		0.47	0.27
woolly Indianwheat	<i>Plantago patagonica</i>		4.26	0.70
<b>Other native forbs</b>		<b>0</b>	<b>4.94</b>	<b>1.15</b>
kochia	<i>Kochia scoparia</i>		2.37	0.57
prickly lettuce	<i>Lactuca serriola</i>		0.16	0.16
Russian thistle	<i>Salsola iberica</i>		1.26	0.43
<b>Unidentified forbs</b>				

UF20			2.68	0.60
<b>Shrubs</b>		7-15	10.09	0.92
western sandcherry	<i>Prunus pumila</i>	3-10	0.00	0.00
leadplant	<i>Amorpha canescens</i>	2-7	0.00	0.00
sand sagebrush	<i>Artemisia filifolia</i>	1-5	9.94	0.77
prairie rose	<i>Rosa arkansana</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.00	0.00
purple pincushion	<i>Escobaria vivipara</i> var. <i>vivipara</i>	0-1	0.00	0.00
skunkbrush sumac	<i>Rhus trilobata</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.00	0.00
spreading buckwheat	<i>Eriogonum effusum</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-5	0.16	0.16
brittle cactus	<i>Opuntia fragilis</i>		0.16	0.16

<b>Ground Cover</b>	
Type	% Cover
Plant	32.92
Litter	50.83
Bare	16.39
Rock	0.00
n	600



**Figure 113: Sandy Bottomland N Plant Group Composition** - This graph depicts the current plant group composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that plant group on the Ecological Site. The yellow is the current group composition.



**Figure 112: Sandy Bottomland N Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

## Sandy Bottomland N



**Figure 114: Photographs of Sandy Bottomland N** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.



## Sandy Salt Flat:

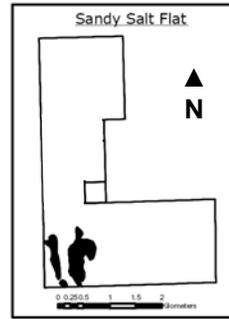
**Site Type:** Rangeland

**Site Name:** Sandy Salt Flat

**Site ID:** R067BY032CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**Soil Classification:** Ustic Torriothents\*



### **Physiographic Features**

This site occupies broad, flat areas (fans and drainage ways) that are slightly depressed from adjacent areas. These areas receive additional runoff from surrounding areas. There is no significant flooding or ponding with a runoff class of low to high.

### **Soil Features**

The soils of this site are very deep, well drained, and moderately and slowly permeable. These soils occur on fans and drainage ways. The parent material is eolian deposits over clayey alluvium derived mainly from shale. The subsoil has significant salinity and sodicity levels which influence plant species composition and growth. Up to 5 percent gypsum may also be present in the subsoil. Most soils have salts and/or alkali at depths of 10 to 40 inches. The available water capacity is typically low (due to sodium). The pH ranges from slightly to very strongly alkaline. The soil surface layer is typically 0 to 2 inches thick and is loamy sand or sandy loam. The soil moisture regime is ustic aridic. The soil temperature regime is mesic.

The Historic Climax Plant Community (HCPC) should show slight to no evidence of rills. Wind scoured areas with pedestaled plants may occur but should be minor. Water flow paths are broken, irregular in appearance or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact. Slick spots are bare exposed areas that are high in sodium (SAR >13). They are inherent to the site and are intermingled with areas of vegetation. The clayey subsoil restricts water movement.

Major soil series correlated to this Ecological Site include: Firstview and Keyner

**Parent Material Kind:** alluvium

**Parent Material Origin:** mixed

**Surface Texture:** loamy sand, sandy loam

**Surface Texture Modifier:** none

**Subsurface Texture Group:** clayey

**Surface Fragments < 3" (% Cover):** 0

**Surface Fragments > 3" (%Cover):** 0

**SubSurface Fragments < 3" (% Volume):** 0 - 15

**Subsurface Fragments > 3" (% Volume):** 0

**Drainage Class:** well

**Permeability Class:** slow - moderate

**Depth (inches):** 80

**Electrical Conductivity (mmhos/cm)\*\*:** 2 - 32

**Sodium Absorption Ratio\*\*:** 0 - 25

**Soil Reaction (1:1 Water)\*\*:** 7.4 - 10.0

**Available Water Capacity (inches)\*\*:** 3 - 5

**Calcium Carbonate Equivalent (percent)\*\*:** 1 - 15

### **Historic Climax Plant Community:**

\*A complete soil classification table for Kiowa County is located in Appendix E.

\*\*These attributes represent 0-40 inches in depth or to the first restrictive layer.

The historic climax plant community (description follows) has been determined by study of rangeland relic areas, areas protected from excessive disturbance, seasonal use pastures, short durational/time controlled grazing and historical accounts.

The plant community described should not necessarily be thought of as the "Desired Plant Community". According to the USDA NRCS National Range and Pasture Handbook, Desired Plant Communities will be determined by the decision-makers and will meet minimum quality criteria established by the NRCS. The main purpose for, including any description of a plant community here is to capture the current knowledge and experience at the time.

#### **Alkali Sacaton, Blue Grama, Switchgrass, Western Wheatgrass Plant Community**

This is the interpretive plant community and is considered to be the Historic Climax Plant Community (HCPC). This plant community developed by large grazing transient herbivores, is well suited for domestic livestock grazing and can be found on are that are properly managed with prescribed grazing that allow for adequate recovery periods following each grazing event during the growing season.

This community consists chiefly of tall and mid warm and cool season grasses. The landscape is undulating sand over fine textured alluvium. The potential vegetation is about 85-90% grasses and grass-like plants, 5-10% forbs and 5-15% shrubs by air dry weight. Principal dominant grasses consist of alkali sacaton, sand bluestem, switchgrass, western wheatgrass and blue grama. Secondary grasses and grass-like plants are inland saltgrass, sand dropseed, little bluestem, and sun sedge. Forbs and shrubs such as ironplant goldenweed, Louisiana sagewort, dotted gayfeather, sand sagebrush and green plume rabbitbrush are common.

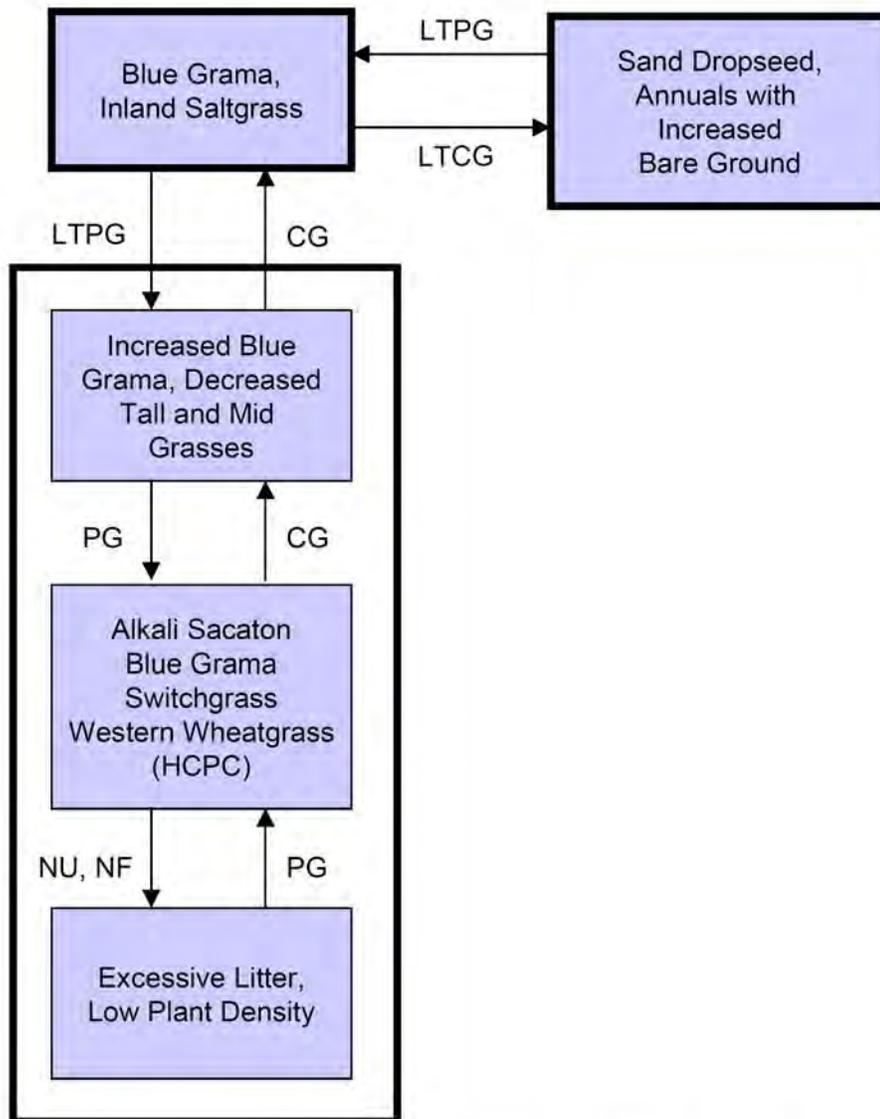
This plant community is diverse, stable and productive and is well adapted to the Northern Great Plains climatic conditions. Litter is properly distributed with very little movement off-site and natural plant mortality is very low. It is well suited to carbon sequestration, water yield, wildlife use by many species, livestock use and is esthetically pleasing. Community dynamics, nutrient cycle, water cycle and energy flow are functioning properly. This community is resistant to many disturbances except continuous grazing, tillage and/or development into urban or other uses.

Production in this community can vary from 800 to 2200 pounds of air-dry vegetation per acre per year depending on the weather and will average 1400 pounds.

#### ***Plant Communities and Transitional Pathways***

Deterioration of this site, due to continuous grazing without adequate recovery periods following each grazing occurrence, will cause blue grama and inland saltgrass to increase. Alkali sacaton, switchgrass, sand bluestem and western wheatgrass will decrease in frequency and production. Sand dropseed, annuals and bare ground increase under long term continuous grazing. Plant communities subjected to extended periods of non-use (rest) or absence of fire will produce excess litter and ultimately reduce plant density.

The following diagram illustrates the common plant communities that can occur on the site and the transition pathways (arrows) among communities. Bold lines surrounding each plant community or communities represent ecological thresholds (USDA, NRCS 2004). The ecological processes are discussed in more detail in the Ecological Site Description from the NRCS Field Office Technical Guide.



**CG** - continuous grazing without adequate recovery opportunity, **HCPC** - Historic Climax Plant Community, **LTPG** - long term prescribed grazing (>40 yrs), **NF** - no fire, **NU** - non-use, **PG** - prescribed grazing with adequate recovery periods

**Figure 115: Sandy Salt Flat State and Transition Model** - Diagram of the Sandy Salt Flat Ecological Site MRLA 67B community states and transitions (USDA, NRCS 2004).

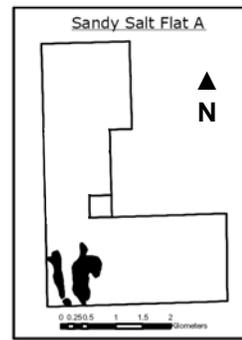
## Sandy Salt Flat Early Seral

### Sandy Salt Flat A

The Sandy Salt Flat A stratum is located on southwest portion of the property. Sands A is southwest of Sand Creek and primarily occupies NPS land on section 25 T17S R46W.

The composition of the area does not fit any Plant Community Narratives but is closest to the **Sand Dropseed, Annuals, with Increased Bare Ground Plant Community** and the **Blue Grama, Inland Saltgrass Plant Community**. These communities are usually achieved through long term continuous grazing. Bare ground is not a problem on the stratum but small playas common. Most dominant grasses from the HCPC were not detected, including alkali sacaton, switchgrass, sand bluestem, and western wheatgrass. The other dominant grass, blue grama, was detected below the HCPC level at 5.92% ( $\pm 0.61$ ). The current dominant grass species were detected at 10.87% ( $\pm 0.36$ ) sand dropseed, 6.64% ( $\pm 0.60$ ) sixweeks fescue, 6.28% ( $\pm 0.61$ ) red threeawn, and 5.92% ( $\pm 0.61$ ) blue grama. Nine of the thirteen HCPC forbs were detected. The current dominant forb species were mostly annuals and were detected at a relative abundance of 5.43% ( $\pm 0.60$ ) pepperpod mustard, 5.19% ( $\pm 0.60$ ) beggars tick, 5.19% ( $\pm 0.60$ ) woolly Indianwheat, and 3.50% ( $\pm 0.55$ ) western ragweed. Most dominant shrubs of the HCPC were not detected, including fourwing saltbush, winterfat, and green plume rabbitbrush. The other dominant shrub (also the current dominant shrub), Sand sagebrush, was the detected at 7.61% ( $\pm 0.59$ ), twice the abundance in the HCPC. Brittle cactus was also detected at 0.12% ( $\pm 0.12$ )

The Sand Dropseed, Annuals, with Increased Bare Ground and the Blue Grama, Inland Saltgrass Plant Communities are not stable and have lost much biotic integrity/species diversity. These communities also see reduced nutrient/water/energy cycles and organic matter levels. This area does not show the advanced stages of desertification usually associated with these plant communities but should be closely monitored for erosion. Although many of the dominant species of the HCPC are not found within the Sandy Salt Flat A stratum, most of the species are found within the SCMNHs. Species not found on the SCMNHs include alkali bluegrass, fourwing saltbush, winterfat, and green plume rabbitbrush. However, these species may be present on neighboring lands.



## Sandy Salt Flat A

**Site Type:** Rangeland

**Site Name:** Sandy Salt Flat

**Site ID:** R067BY032CO

**Major Land Resource Area:** 67B - Central High Plains, Southern Part

**n :** 100

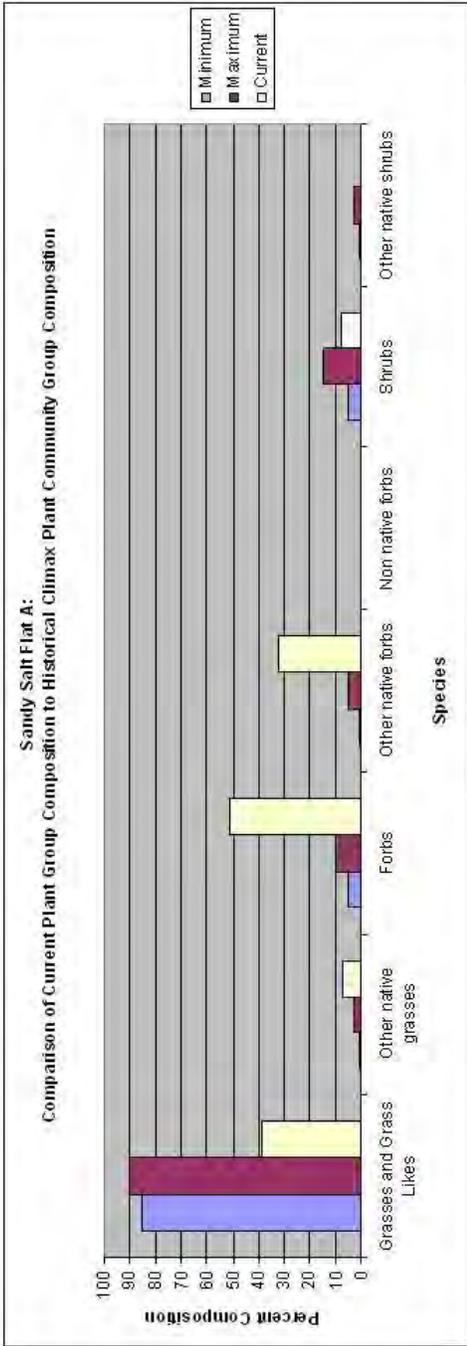
**Date:** June 2005

**Table 42: Sandy Salt Flat A Composition & Ground Cover** - This table lists the current and potential vegetation of the strata based on the Ecological Site Description. This table also lists the current ground cover for the strata.

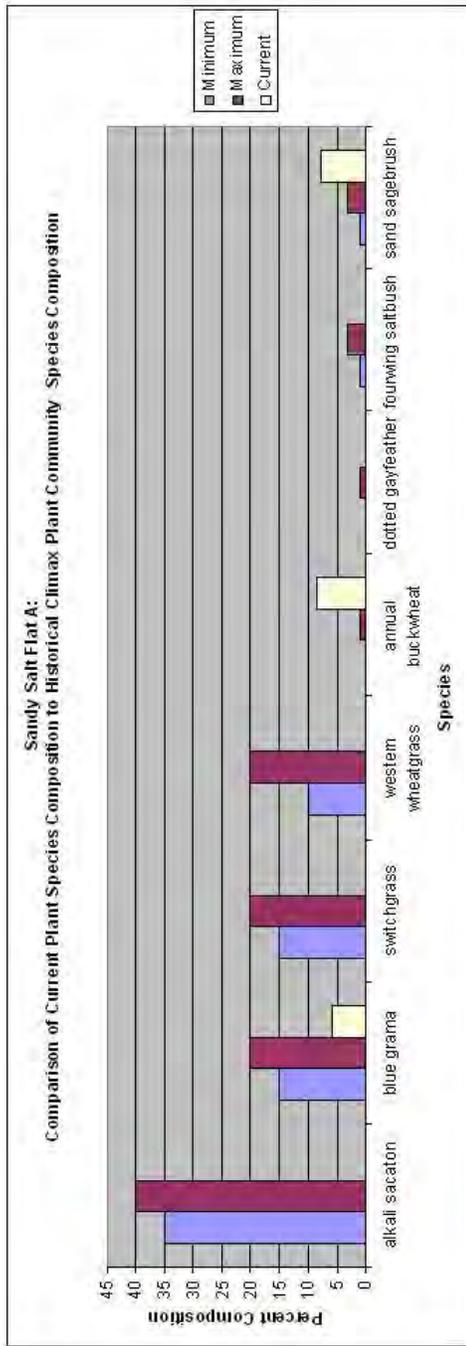
Common Name	Scientific Name	Potential % Comp	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>		<b>85-90</b>	<b>38.77</b>	<b>4.23</b>
alkali sacaton	<i>Sporobolus airoides</i>	35-40	0.00	0.00
blue grama	<i>Bouteloua gracilis</i>	15-20	5.92	0.61
switchgrass	<i>Panicum virgatum</i>	15-20	0.00	0.00
western wheatgrass	<i>Pascopyrum smithii</i>	10-20	0.00	0.00
sand bluestem	<i>Andropogon hallii</i>	10-15	0.00	0.00
inland saltgrass	<i>Distichlis spicata</i>	1-5	3.38	0.55
needleandthread	<i>Hesperostipa comata</i>	1-5	0.24	0.17
alkali bluegrass	<i>Poa secunda</i>	1-3	0.00	0.00
buffalograss	<i>Buchloe dactyloides</i>	1-3	0.00	0.00
tall dropseed	<i>Sporobolus compositus</i>	1-3	0.00	0.00
sand dropseed	<i>Sporobolus cryptandrus</i>	1-2	10.87	0.36
prairie sandreed	<i>Calamovilfa longifolia</i>	0-3	0.12	0.12
little bluestem	<i>Schizachyrium scoparium</i>	0-2	0.00	0.00
sideoats grama	<i>Bouteloua curtipendula</i>	0-2	0.72	0.29
bottlebrush squirreltail	<i>Elymus elymoides</i>	0-1	3.99	0.57
galleta	<i>Hilaria jamesii</i>	0-1	0.00	0.00
Indian ricegrass	<i>Achnatherum hymenoides</i>	0-1	0.00	0.00
red threeawn	<i>Aristida purpurea</i>	0-1	6.28	0.61
ring muhly	<i>Muhlenbergia torreyi</i>	0-1	0.00	0.00
slender wheatgrass	<i>Elymus trachycaulus</i>	0-1	0.00	0.00
sun sedge	<i>Carex inops ssp. heliophila</i>	1-2	0.00	0.00
<b>Other native grasses</b>		<b>1-3</b>	<b>7.25</b>	<b>0.96</b>
sixweeks fescue	<i>Vulpia octoflora</i>		6.64	0.60
tumblegrass	<i>Schedonnardus paniculatus</i>		0.48	0.24
windmill grass	<i>Chloris verticillata</i>		0.12	0.12
<b>Forbs</b>		<b>5-10</b>	<b>51.21</b>	<b>9.25</b>
annual buckwheat	<i>Eriogonum annuum</i>	0-1	8.45	0.56
dotted gayfeather	<i>Liatris punctata</i>	0-1	0.00	0.00
hairy goldenaster	<i>Haplopappus spinulosus</i>	0-1	0.60	0.26
lemon scurfpea	<i>Psoralidium lanceolatum</i>	0-1	0.00	0.00
Louisiana sagewort	<i>Artemisia ludoviciana</i>	0-1	0.72	0.29
Nuttalls evolvulus	<i>Evolvulus nuttallianus</i>	0-1	0.36	0.21
penstemons	<i>Penstemon spp.</i>	0-1	0.00	0.00

prairie spiderwort	<i>Tradescantia occidentalis</i>	0-1	0.24	0.17
scarlet globemallow	<i>Sphaeralcea coccinea</i>	0-1	2.66	0.50
slimflower scurfpea	<i>Psoraleidium tenuiflorum</i>	0-1	1.45	0.39
stickleaf mentzilia	<i>Mentzelia decapetala</i>	0-1	0.00	0.00
western ragweed	<i>Ambrosia psilostachya</i>	0-1	3.50	0.55
woolly locoweed	<i>Astragalus mollissimus</i>	0-1	0.48	0.24
<b>Other native forbs</b>		1-5	32.13	5.72
Astragalus sp. #6	<i>Astragalus sp.</i>		0.24	0.17
beggars tick	<i>Cryptantha circumscissa</i>		5.19	0.60
conyza	<i>Conyza canadensis</i>		4.23	0.58
evening-primrose	<i>Oenothera spp.</i>		1.21	0.36
fame flower	<i>Talinum parviflorum</i>		0.24	0.17
heath aster	<i>Symphotrichum ericoides</i>		3.26	0.54
lambquarters	<i>Chenopodium album</i>		0.12	0.12
narrowleaf stoneseed	<i>Lithospermum incisum</i>		0.48	0.24
pepperpod mustard	<i>Lepidium densiflorum</i>		5.43	0.60
upright prairie coneflower	<i>Ratibida columnifera</i>		1.93	0.44
prairie groundcherry	<i>Physalis pumila</i>		0.24	0.17
rush skeletonplant	<i>Lygodesmia juncea</i>		2.54	0.49
wavyleaf thistle	<i>Cirsium undulatum</i>		0.60	0.26
western fleabane	<i>Erigeron bellidiastrum</i>		1.21	0.36
woolly Indianwheat	<i>Plantago patagonica</i>		5.19	0.60
<b>Non native forbs</b>		1-5	0.60	0.36
prickly lettuce	<i>Lactuca scariola</i>		0.12	0.12
Russian thistle	<i>Salsola iberica</i>		0.48	0.24
<b>Unidentified forbs</b>				
UF20			2.29	0.48
<b>Shrubs</b>		5-15	7.73	0.71
fourwing saltbush	<i>Atriplex canescens</i>	1-3	0.00	0.00
sand sagebrush	<i>Artemisia filifolia</i>	1-3	7.61	0.59
winterfat	<i>Krascheninnikovia lanata</i>	1-3	0.00	0.00
	<i>Ericameria nauseosa ssp. nauseosa var. glabrata</i>			
green plume rabbitbrush		1-2	0.00	0.00
broom snakeweed	<i>Gutierrezia sarothrae</i>	0-1	0.00	0.00
plains pricklypear	<i>Opuntia polyacantha</i>	0-1	0.00	0.00
small soapweed	<i>Yucca glauca</i>	0-1	0.00	0.00
spreading buckwheat	<i>Eriogonum effusum</i>	0-1	0.00	0.00
<b>Other native shrubs</b>		1-3	0.12	0.12
brittle cactus	<i>Opuntia fragilis</i>		0.12	0.12

Ground Cover	
Type	% Cover
Plant	37.83
Litter	39.17
Bare	22.83
Rock	0.17
n	600

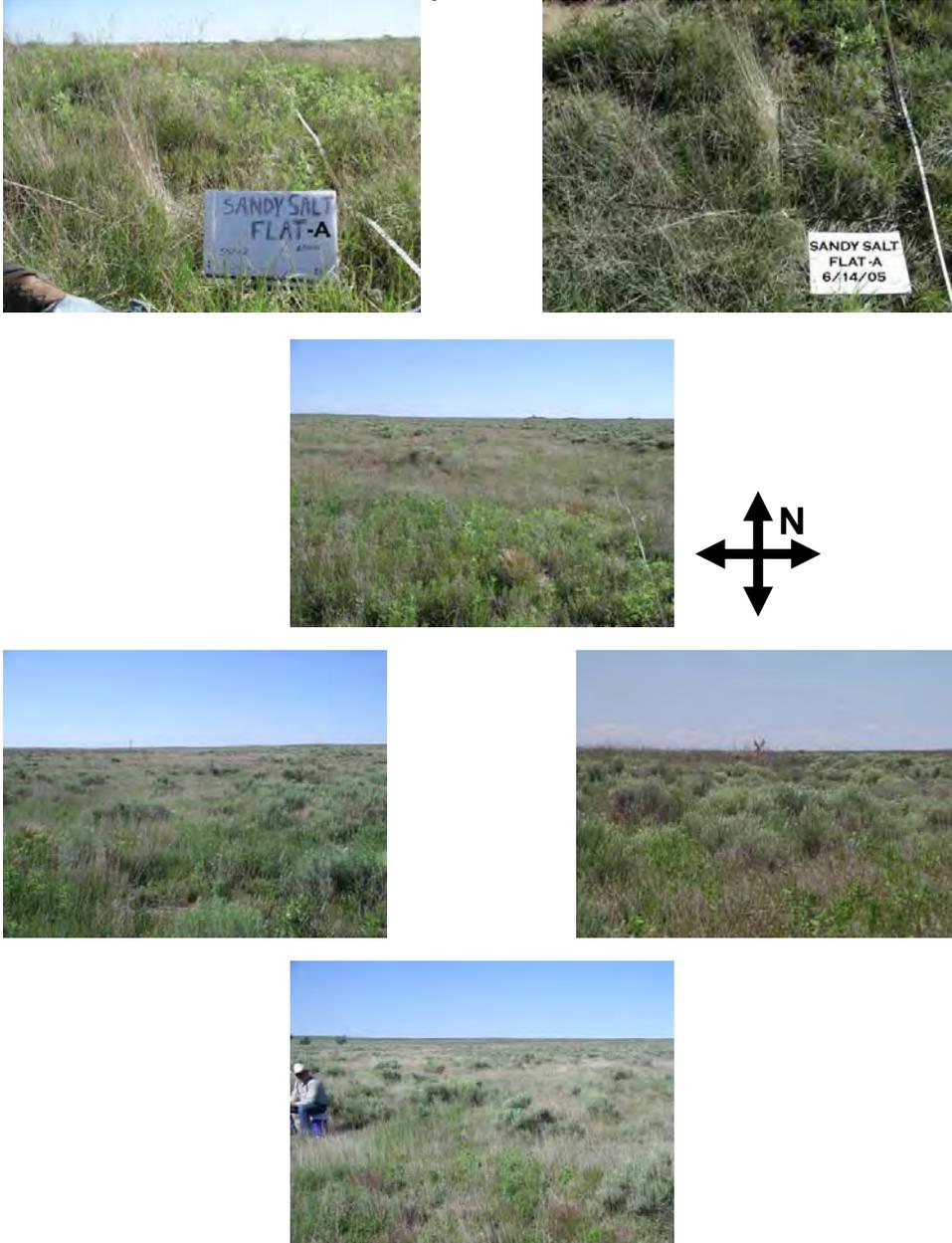


**Figure 117: Sandy Salt Flat A Plant Group Composition** - This graph depicts the current plant group composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that plant group on the Ecological Site. The yellow is the current group composition.



**Figure 116: Sandy Salt Flat A Species Composition** - This graph depicts the current plant species composition compared to the potential composition. The blue is the minimum and the red is the maximum composition expected of that species on the Ecological Site. The yellow is the current species composition.

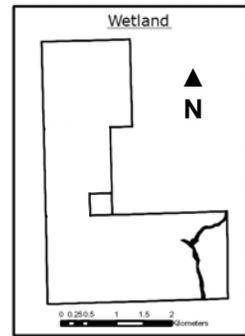
### Sandy Salt Flat A



**Figure 118: Photographs of Sandy Salt Flat A** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.

## Wetland:

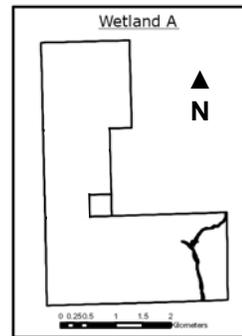
The U.S. Fish and Wildlife Service (USFWS) define wetlands as “lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water.” USFWS-defined wetlands must have *one or more* of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes (wetland plants); (2) the substrate is predominantly undrained hydric soil; and/or (3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year (Carsey, Kittel, Decker, Cooper, & Culver 2003).



## Wetland Mid Seral

### Wetland A

The Wetland A stratum is located on southeast portion of the property. Wetland A runs along Sand Creek and occupies NPS land on sections 30 T17S R45W.



Wetlands are not addressed in The Ecological Site descriptions and this community requires more study to determine its correct wetland classification. The stratum is dominated by foxtail barley, bulrush, and annual forbs. The current dominant grass species were detected at 13.18% ( $\pm 1.12$ ) foxtail barley, 10.08% ( $\pm 1.16$ ) scratchgrass, 6.98% ( $\pm 1.10$ ) inland saltgrass, 4.39% ( $\pm 0.95$ ) alkali sacaton, and 4.13% ( $\pm 0.93$ ) Canada wildrye. The current dominant grass-like species were detected at a relative abundance of 12.66% ( $\pm 1.13$ ) bulrush, 7.75% ( $\pm 1.13$ ) Baltic rush, and 5.17% ( $\pm 1.01$ ) spike rush. The current dominant forb species were detected at a relative abundance of 9.04% ( $\pm 1.15$ ) kochia, 3.62% ( $\pm 0.88$ ) western ragweed, and 1.29% ( $\pm 0.56$ ) poison milkweed. No shrubs were detected.

The diversity between transects in this strata was large. There are distinct wetland communities found at the SCMNHs and the following is a rough estimate of those communities based on transects and casual observation. It should be noted that these communities were keyed and defined in the office and not in the field. Four wetland communities are likely to be present on the SCMNHs, these are described below and are illustrated in Appendix A-VIII (The following descriptions are adapted from the Field Guide to Rocky Mountain Region Wetland/Riparian Areas).

North of the canal harbors a **Hardstem bulrush-Softstem bulrush Herbaceous Vegetation**. This association is characterized by nearly pure stands of *Scirpus acutus* and/or *Scirpus tabernaemontani*. Other species found in this association are *Eleocharis palustris*, *E. rostellata*, *Carex spp.*, and *Typha spp.* Soils of this association are deep heavy clays and silty loams with high organic matter content and remain saturated most of the growing season. These areas usually have a gleyed layer within 50cm of the surface although the water table can be as low as a meter below the surface.

At the breach in the canal and where the creek meets the road to the south, is **Cattail Herbaceous Vegetation**. This association is characterized by nearly pure stands of *Typha spp.* Other species in this association are bulrushes and *Eleocharis palustris*. Soils are deep, heavy, silty clay loam and organic mucks. These associations occur in at least 0.3m standing water but persist in drier periods. Some profiles have 10-30% coarse material and are fairly well drained, other remain anoxic throughout the year.

The majority of the southern wetlands are **Foxtail Barley Herbaceous Vegetation**. This association is characterized by at least 85% *Hordeum jubatum*. Other species in this association are *Polygonum spp.*, *Scirpus pallidus*, *Alopecurus aequalis*, *Eleocharis palustris*, and *Echinochloa crus-galli*. This association occurs in intermittently/permanently flooded basins, on pond edges, or drawdown zones. Soil salinity is variable.

The north western edge of the wetlands is an **Alkali muhly Herbaceous Vegetation**. Muhlenbergia is the dominant graminoids (up to 8% cover). Other species of this association include *Spartina gracilis*, *Eleocharis palustris*, and *Elymus canadensis*. This association occurs on sandy braided streams, low swales, and brackish marshes. Soils are deep (50-60cm) silty clays and sand over loams (Carsey et al. 2003).

## Wetland A

n : 80

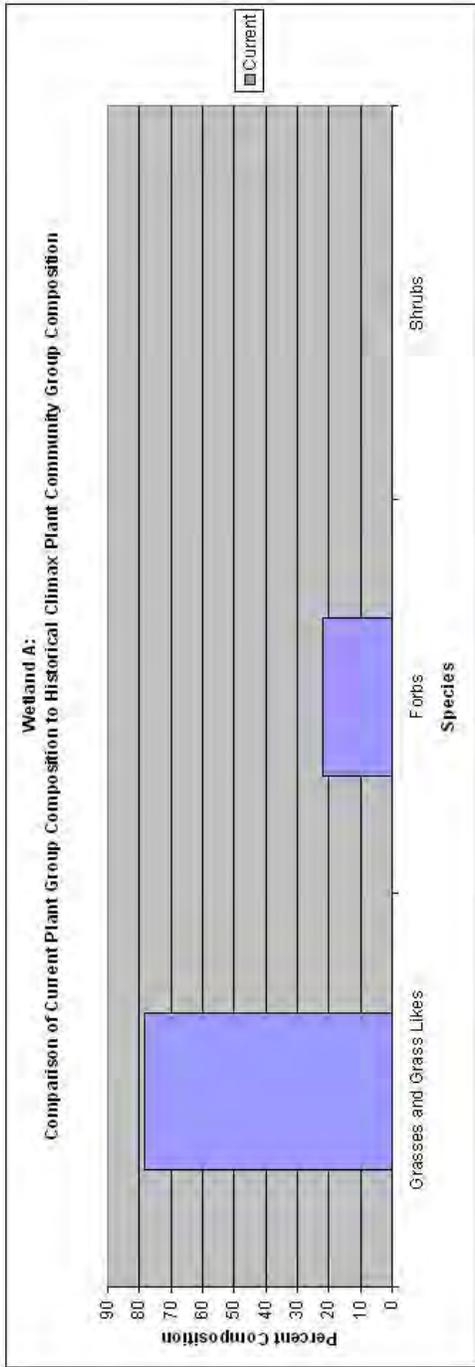
Date: July 2005

**Table 43: Wetland A Composition & Ground Cover** - This table lists the current and potential vegetation of the strata. This table also lists the current ground cover for the strata.

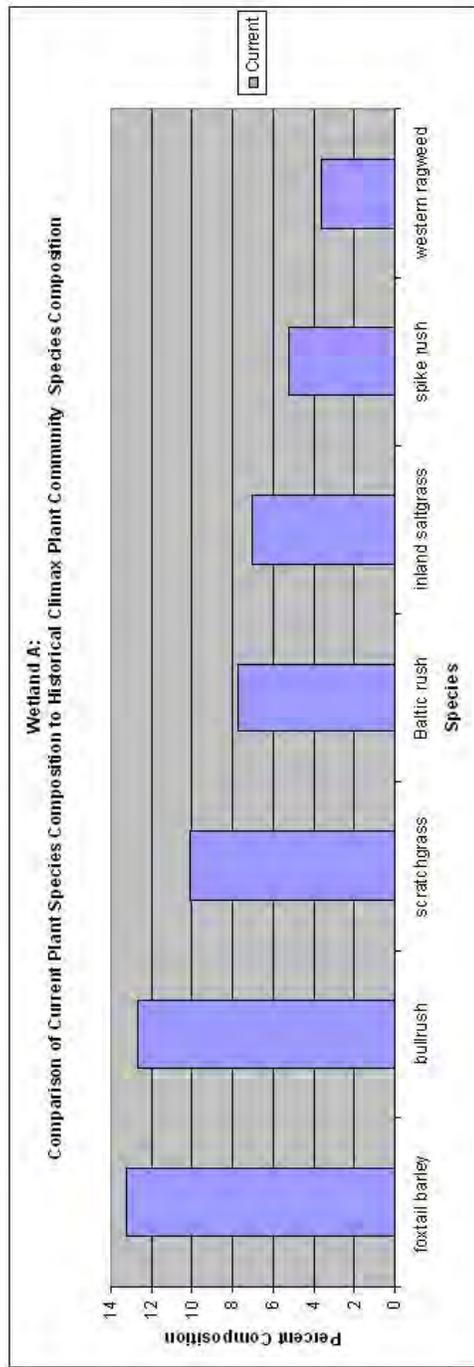
Common Name	Scientific Name	Current % Comp.	Standard Error
<b>Grasses and Grass Likes</b>		<b>78.04</b>	<b>13.83</b>
foxtail barley	<i>Hordeum jubatum</i>	13.18	1.12
bullrush	<i>Scirpus americanus</i>	12.66	1.13
scratchgrass	<i>Muhlenbergia asperifolia</i>	10.08	1.16
Baltic rush	<i>Juncus balticus</i>	7.75	1.13
inland saltgrass	<i>Distichlis spicata</i>	6.98	1.10
spike rush	<i>Eleocharis sp.</i>	5.17	1.01
alkali sacaton	<i>Sporobolus airoides</i>	4.39	0.95
Canada wildrye	<i>Elymus canadensis</i>	4.13	0.93
prairie cordgrass	<i>Spartina pectinata</i>	3.36	0.86
switchgrass	<i>Panicum virgatum</i>	3.36	0.86
Kentucky bluegrass	<i>Poa pratensis</i>	2.58	0.77
cattail	<i>Typha latifolia</i>	1.55	0.61
UG1		0.78	0.44
buffalograss	<i>Buchloe dactyloides</i>	0.52	0.36
western wheatgrass	<i>Pascopyrum smithii</i>	0.52	0.36
UG2		0.26	0.26
prairie sandreed	<i>Calamoviifa longifolia</i>	0.26	0.26
quackgrass	<i>Agropyron repens</i>	0.26	0.26
rabbitsfoot grass	<i>Polypogon monspeliensis</i>	0.26	0.26
<b>Forbs</b>		<b>21.96</b>	<b>8.43</b>
kochia	<i>Kochia scoparia</i>	9.04	1.15
western ragweed	<i>Ambrosia psilostachya</i>	3.62	0.88
poison milkweed	<i>Asclepias subverticillata</i>	1.29	0.56
conyza	<i>Conyza canadensis</i>	1.03	0.51
lambquarters	<i>Chenopodium album</i>	1.03	0.51
heath aster	<i>Symphotrichum ericoides</i>	0.78	0.44
thyme-leaved spurge	<i>Euphorbia serpyllifolia</i>	0.78	0.44
common sunflower	<i>Helianthus annuus</i>	0.52	0.36
pale dock	<i>Rumex altissimus</i>	0.52	0.36
velvet gaura	<i>Gaura parviflora</i>	0.52	0.36
curly dock	<i>Rumex crispus</i>	0.26	0.26
white sweetclover	<i>Melilotus alba</i>	0.26	0.26
upright prairie coneflower	<i>Ratibida columnifera</i>	0.26	0.26
winecup	<i>Callirhoe involucrata</i>	0.26	0.26
showy milkweed	<i>Asclepias speciosa</i>	0.26	0.26
snow on the mountain	<i>Euphorbia marginata</i>	0.26	0.26
common groundcherry	<i>Physalis longifolia</i>	0.26	0.26
field bindweed	<i>Convolvulus arvensis</i>	0.26	0.26
poison ivy	<i>Toxicodendron rydbergii</i>	0.26	0.26
UF25		0.26	0.26
American licorice	<i>Glycyrrhiza lepidota</i>	0.26	0.26

Shrubs		0.00	0.00
--------	--	------	------

Ground Cover	
Type	% Cover
Plant	32.50
Litter	63.33
Bare	4.17
Rock	0.00
n	480



**Figure 119: Wetland A Plant Group Composition** - This graph depicts the current plant group composition of this strata.



**Figure 120: Wetland A Species Composition** - This graph depicts the current plant species composition of this strata.

## Wetland A



**Figure 121: Photographs of Wetland A** - The top left is a profile shot of the transect, the top right is a plot picture, and the lower photographs are of the surrounding area.



## Discussion

The SCMS is an area that has been subject to a large variety of disturbances since the time of the Sand Creek Massacre. The area has been heavily grazed by livestock, farmed and replanted, had an airport landing strip and a large canal installed among other surface disturbing activities. The information from the inventory of plant communities reflects those disturbances.

The vast majority of the sites inventoried had reduced abundance of late seral plant community components and the overall plant composition showed the major effects of disturbance activities. The majority of the communities sampled/inventoried were mostly early to mid seral in their ecological status. Most had large representations of low seral plant species. This was judged to be primarily the influence of the drought interacting with prior disturbance. Our judgment is that the annual plants will quickly diminish as a more normal rainfall regime returns. There are, however, areas of intense disturbance that will have a large annual plant component for the foreseeable future. These areas include go-back fields that have not been planted to perennial grasses. There are other areas that have been replanted but with non-native species. These plants are expected to persist indefinitely into the future.

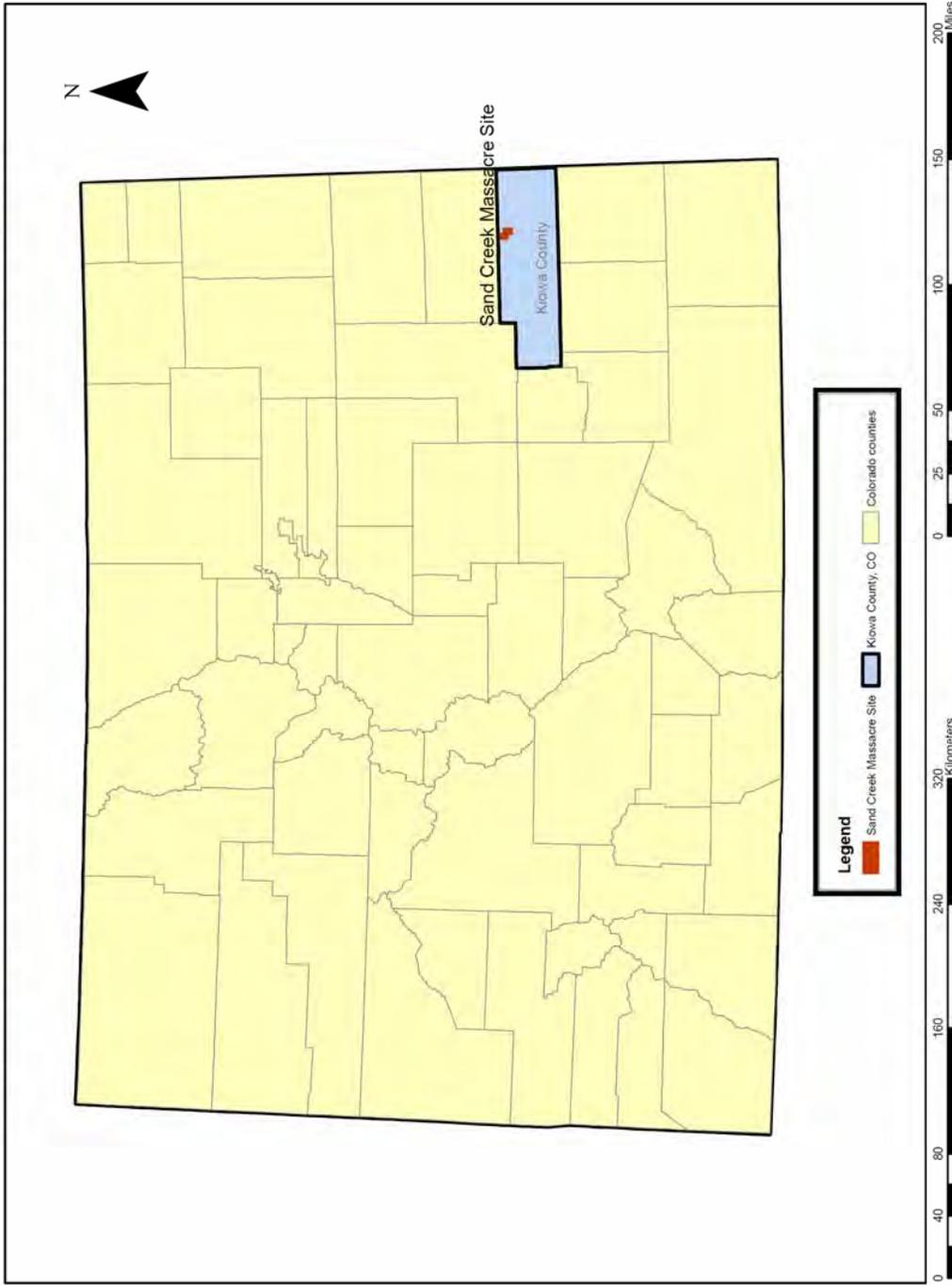


## **Appendix A: Maps**

- I** - Sand Creek Massacre Site: Kiowa County, CO
- II** - Sand Creek Massacre Site: Landowners & Boundaries 2006
- III** - Sand Creek Massacre Site: Landowners & Boundaries 2006 (Outline)
- IV** - Sand Creek Massacre Site: Major Disturbance Areas
- V** - Sand Creek Massacre Site: Ecological Sites MRLA 67B
- VI** - Sand Creek Massacre Site: Ecological Sites MRLA 67B (Outline)
- VII** - Sand Creek Massacre Site: Soil Map Units
- VIII** - Sand Creek Massacre Site: Wetland Types 2005
- IX** - Sand Creek Massacre Site: Community Strata 2005
- X** - Sand Creek Massacre Site: Community Strata 2005 (Outline)
- XI** - Sand Creek Massacre Site: Transect Locations 2005
- XII** - Sand Creek Massacre Site: Seral Strata 2005
- XIII** - Sand Creek Massacre Site: Seral Strata 2005 (Outline)
- XIV** - Sand Creek Massacre Site: Seral Stages 2005



# SAND CREEK MASSACRE SITE: KIOWA COUNTY, CO



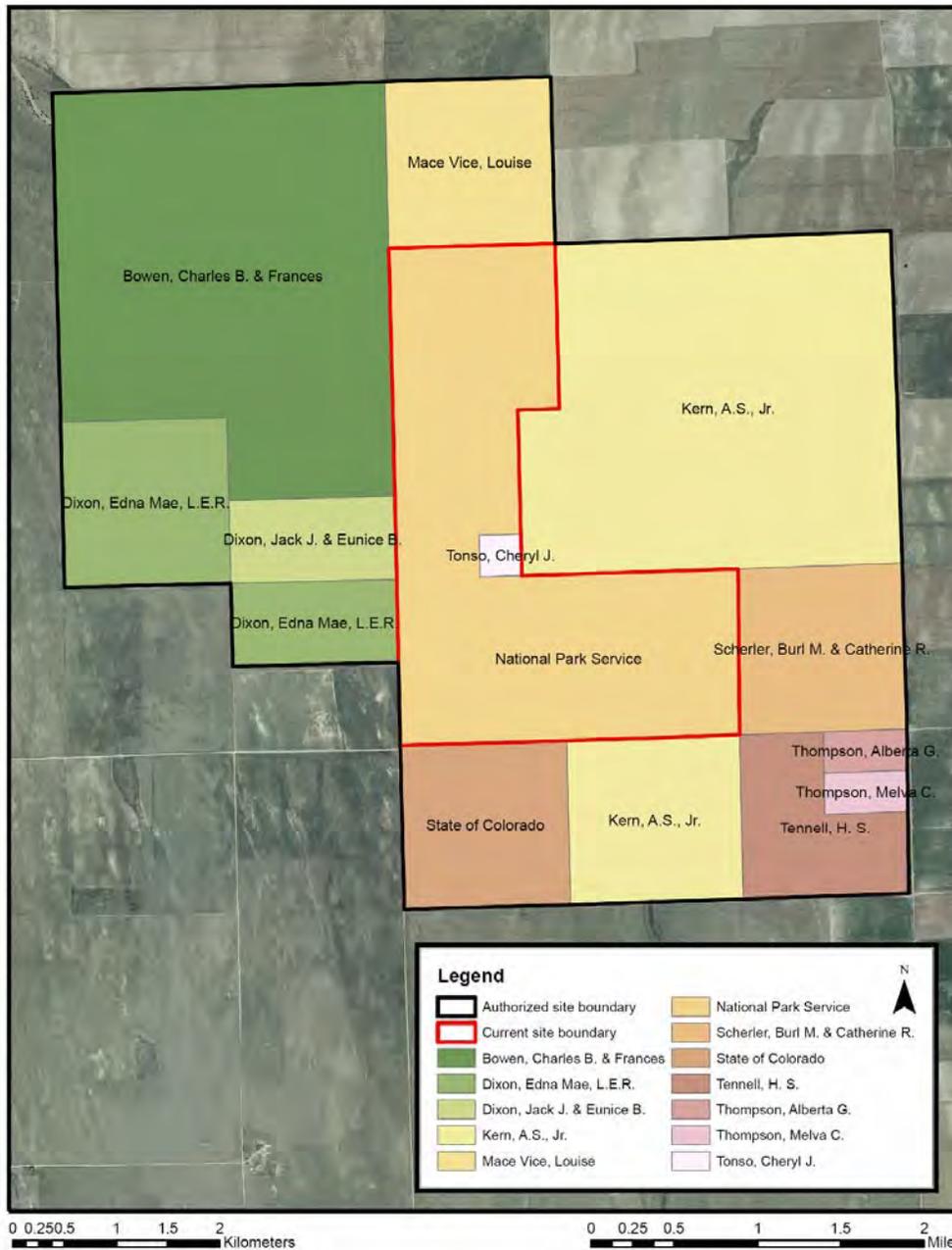
CREATED BY: RACHEL RIDENOUR - 11/29/2006

SOURCES: SAND\_BOUNDARY\_POLY.SHP, COUNTY\_BOUNDARIES.SHP

Figure 13: Sand Creek Massacre Site: Kiowa County, CO Map - This map shows the location of the Sand Creek Massacre Site within Colorado.



## SAND CREEK MASSACRE SITE: LANDOWNERS & BOUNDARIES 2006



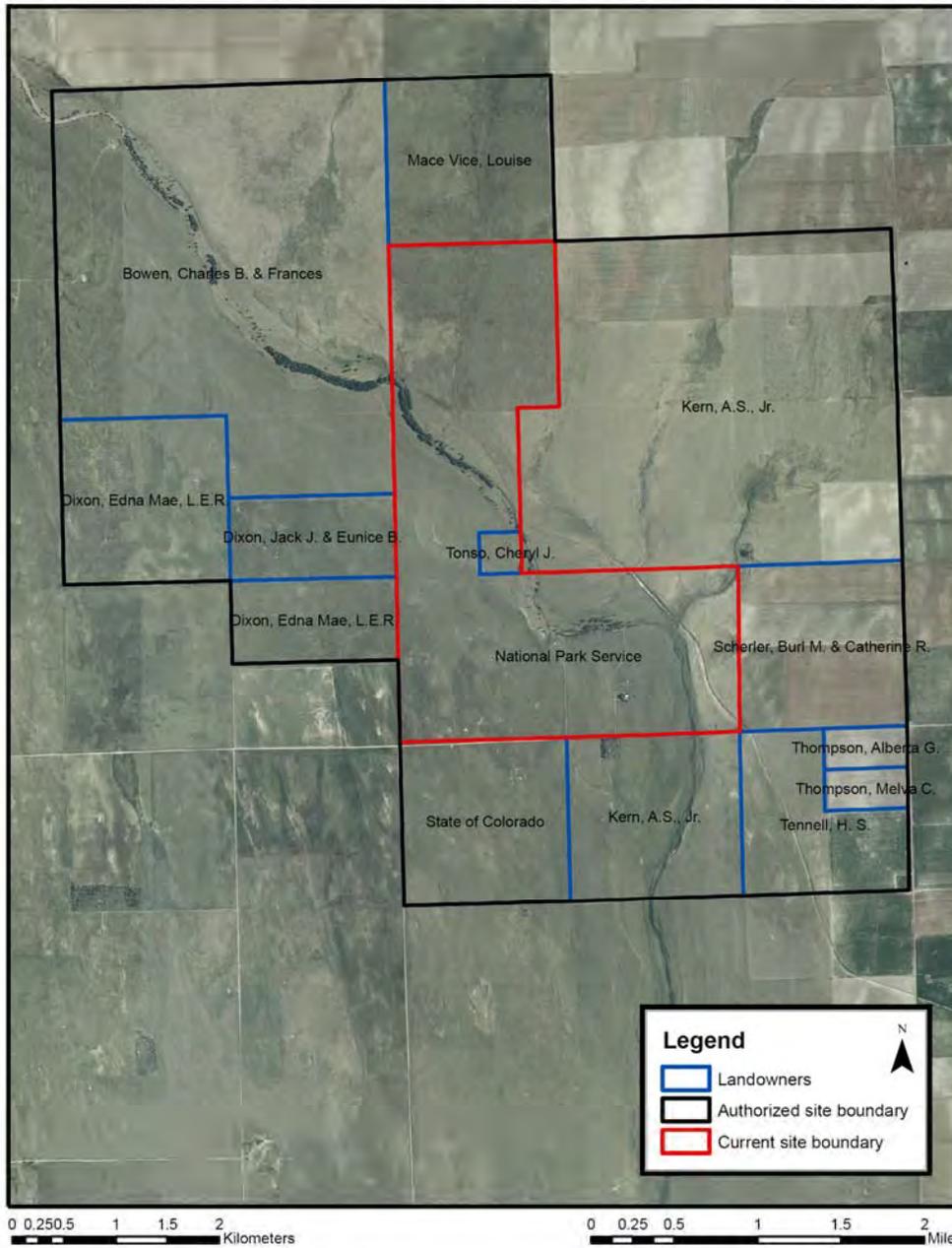
CREATED BY: RACHEL RIDENOUR - 8/9/2006

SOURCE: LANDOWNERS\_GCDB.SHP

**Figure 123: Sand Creek Massacre Site: Landowners & Boundaries Map** - This map shows the landowners on the Sand Creek Massacre Site and the current site boundaries as of 2006.



## SAND CREEK MASSACRE SITE: LANDOWNERS & BOUNDARIES 2006



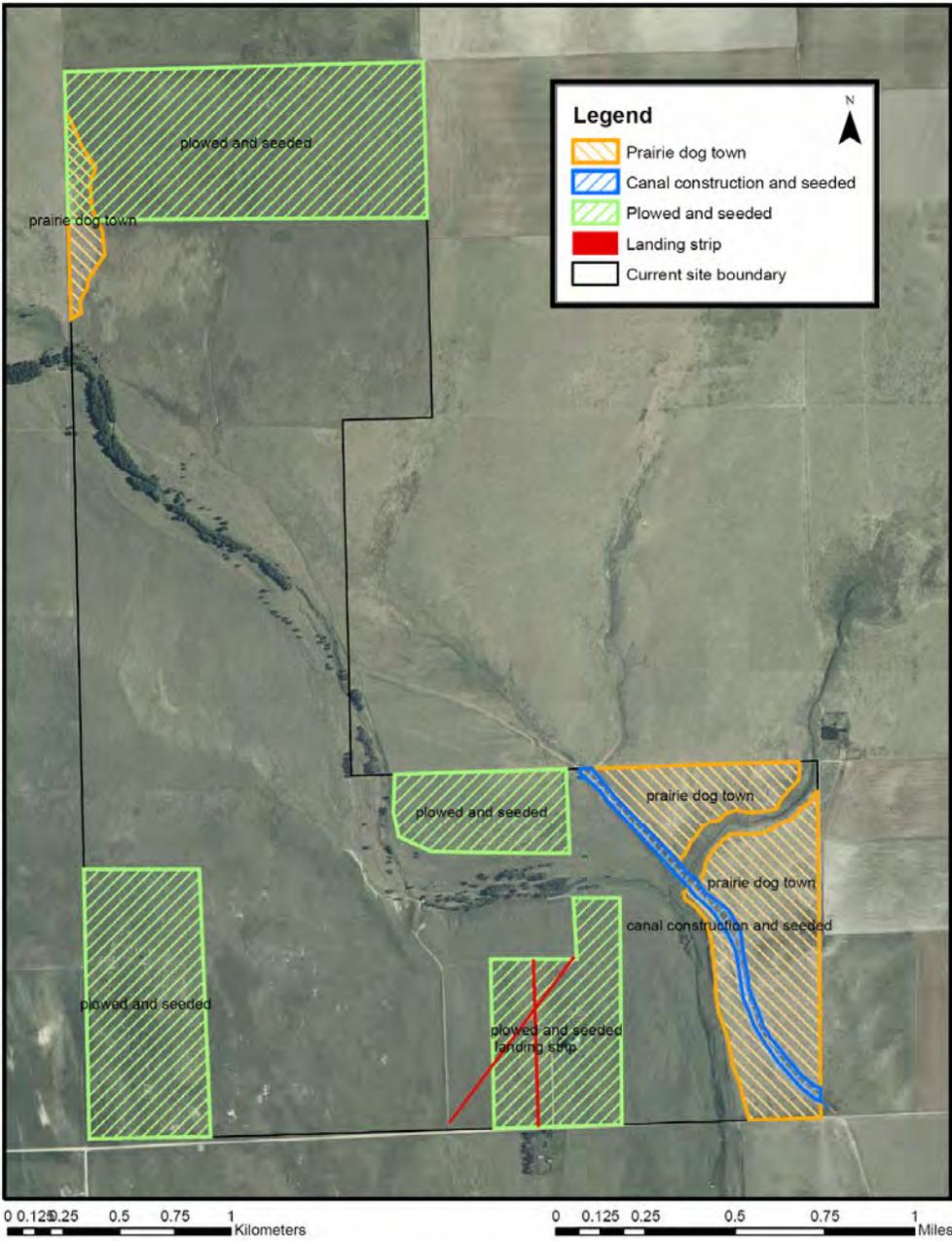
CREATED BY: RACHEL RIDENOUR - 8/9/2006

SOURCE: LANDOWNERS\_GCDB.SHP

**Figure 124: Sand Creek Massacre Site: Land owners & Boundaries Map (Outline)** - This map shows the landowners on the Sand Creek Massacre Site and the current site boundaries as of 2006.



# SAND CREEK MASSACRE SITE: MAJOR DISTURBANCE AREAS

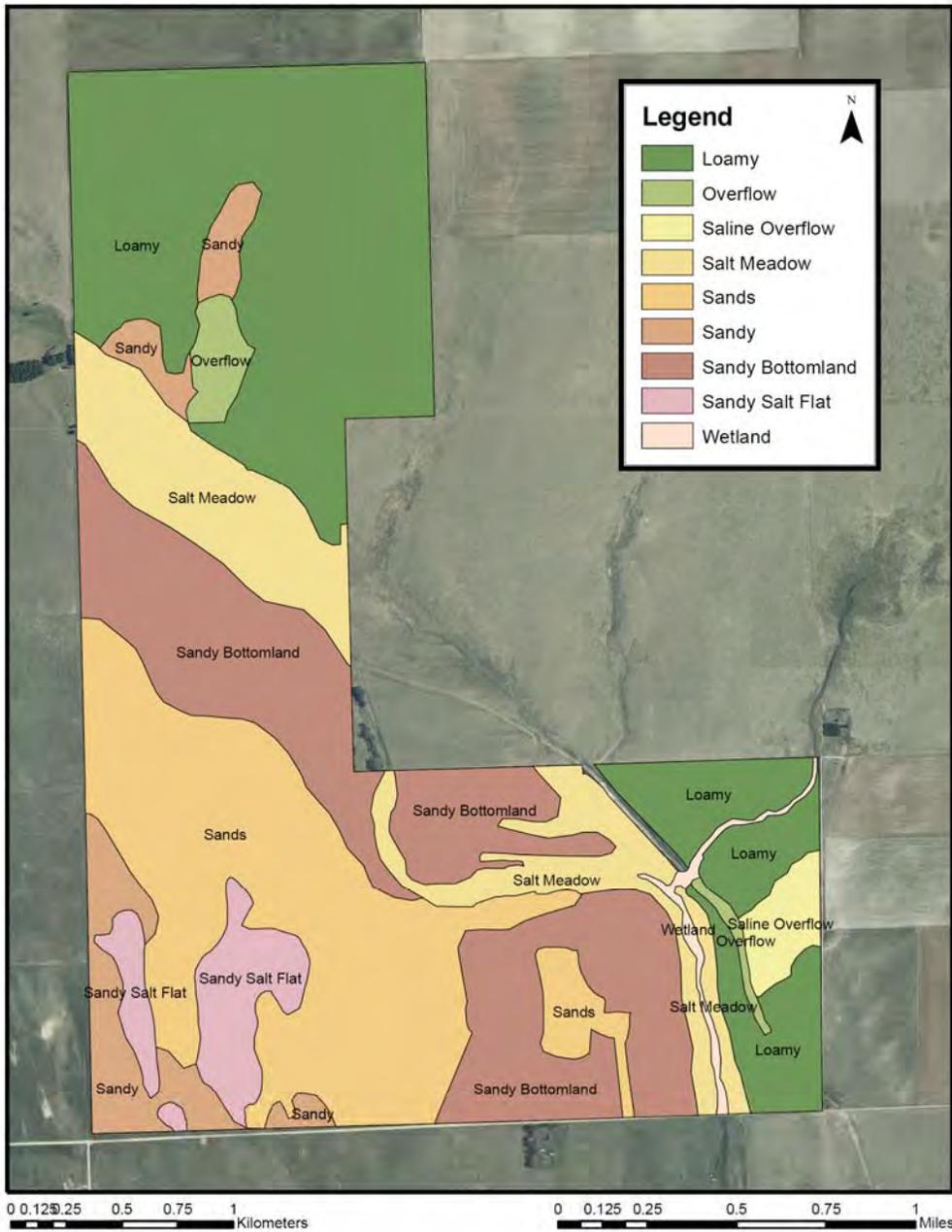


CREATED BY: RACHEL RIDENOUR - 8/9/2006

**Figure 125: Sand Creek Massacre Site: Major Disturbance Areas Map** - This map shows the areas of major disturbance on the Sand Creek Massacre Site.



# SAND CREEK MASSACRE SITE: ECOLOGICAL SITES - MRLA 67B

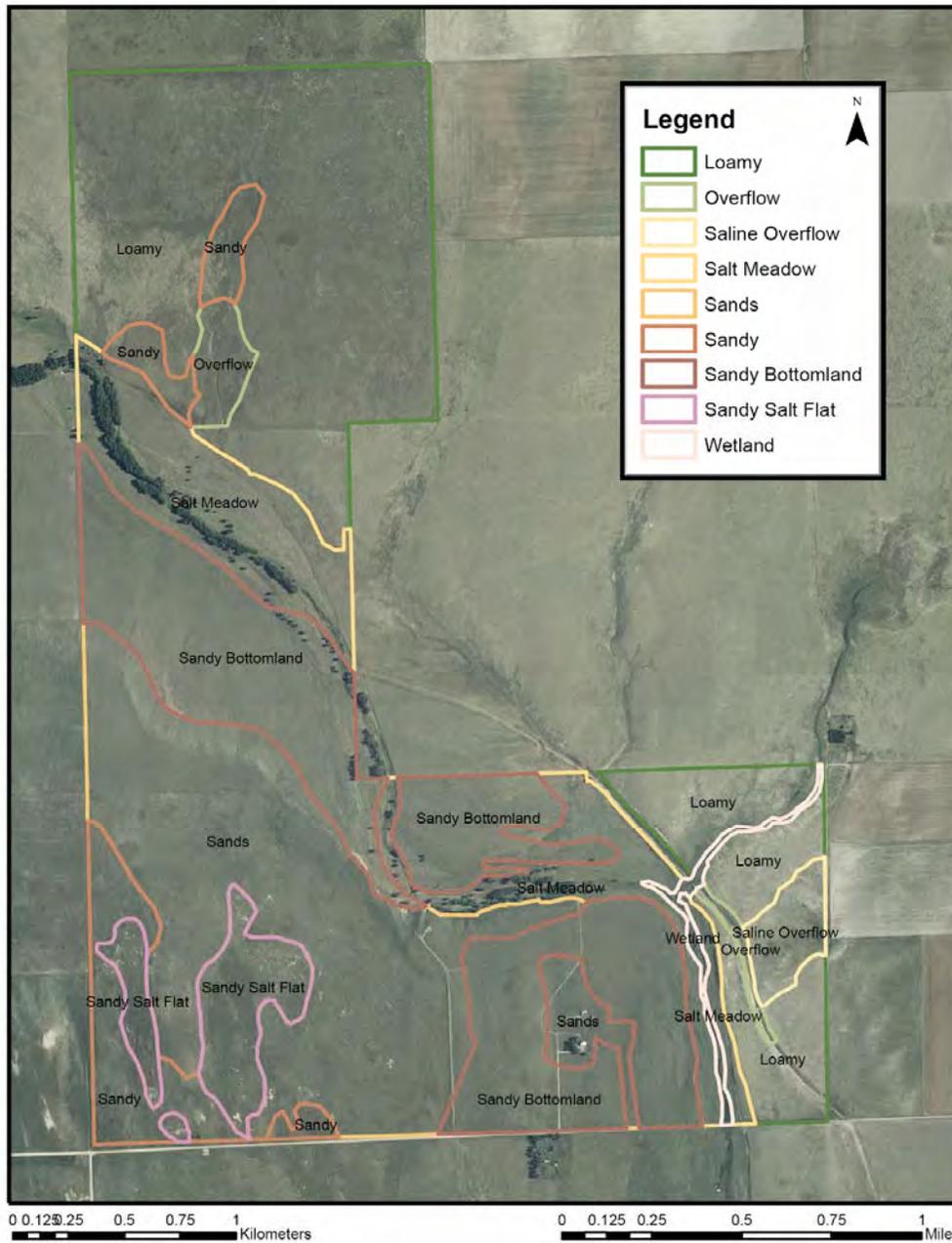


CREATED BY: RACHEL RIDENOUR - 8/9/2006

**Figure 126: Sand Creek Massacre Site: Ecological Sites Map** - This map shows the ecological sites of the Sand Creek Massacre Site as defined by the 2005 Vegetation Inventory.



# SAND CREEK MASSACRE SITE: ECOLOGICAL SITES - MRLA 67B

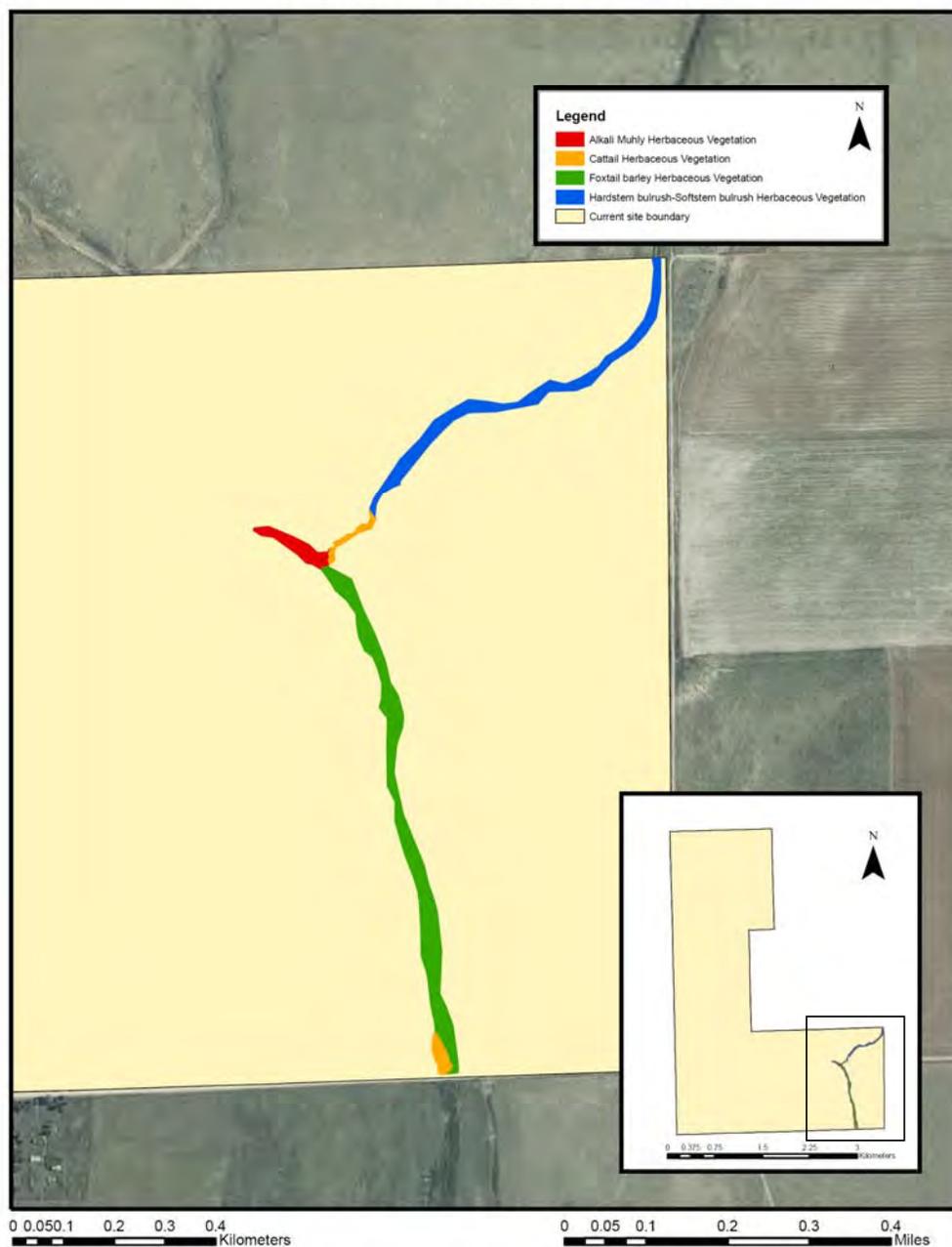


CREATED BY: RACHEL RIDENOUR - 8/9/2006

**Figure 127: Sand Creek Massacre Site: Ecological Sites Map (Outline)** - This map shows the ecological sites of the Sand Creek Massacre Site as defined by the 2005 Vegetation Inventory.



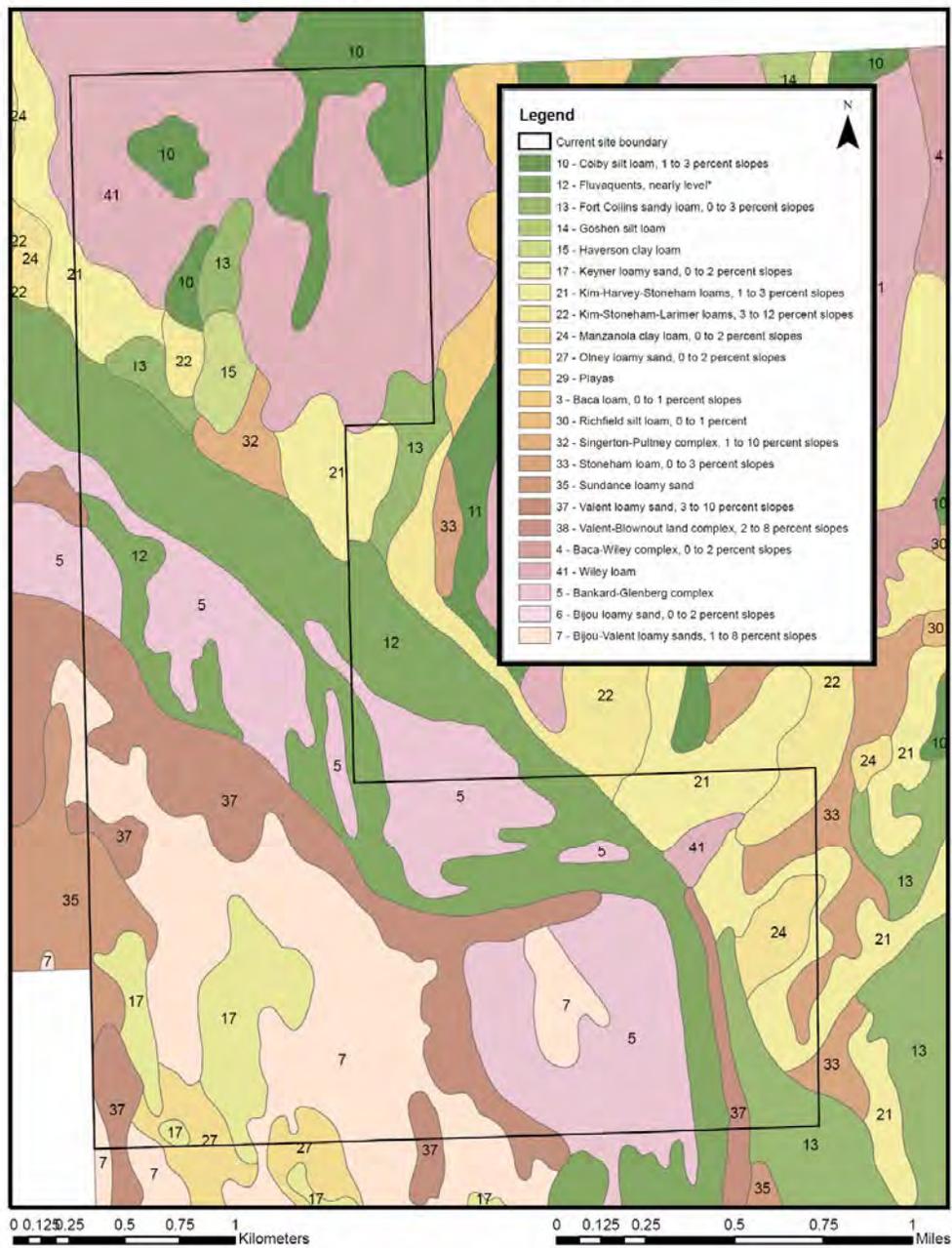
# SAND CREEK MASSACRE SITE: WETLAND TYPES 2005



**Figure 128: Sand Creek Massacre Site: Wetland Types Map** - This map shows the wetland types on the Sand Creek Massacre Site as defined by the 2005 Vegetation Inventory.



# SAND CREEK MASSACRE SITE: SOIL MAP UNITS



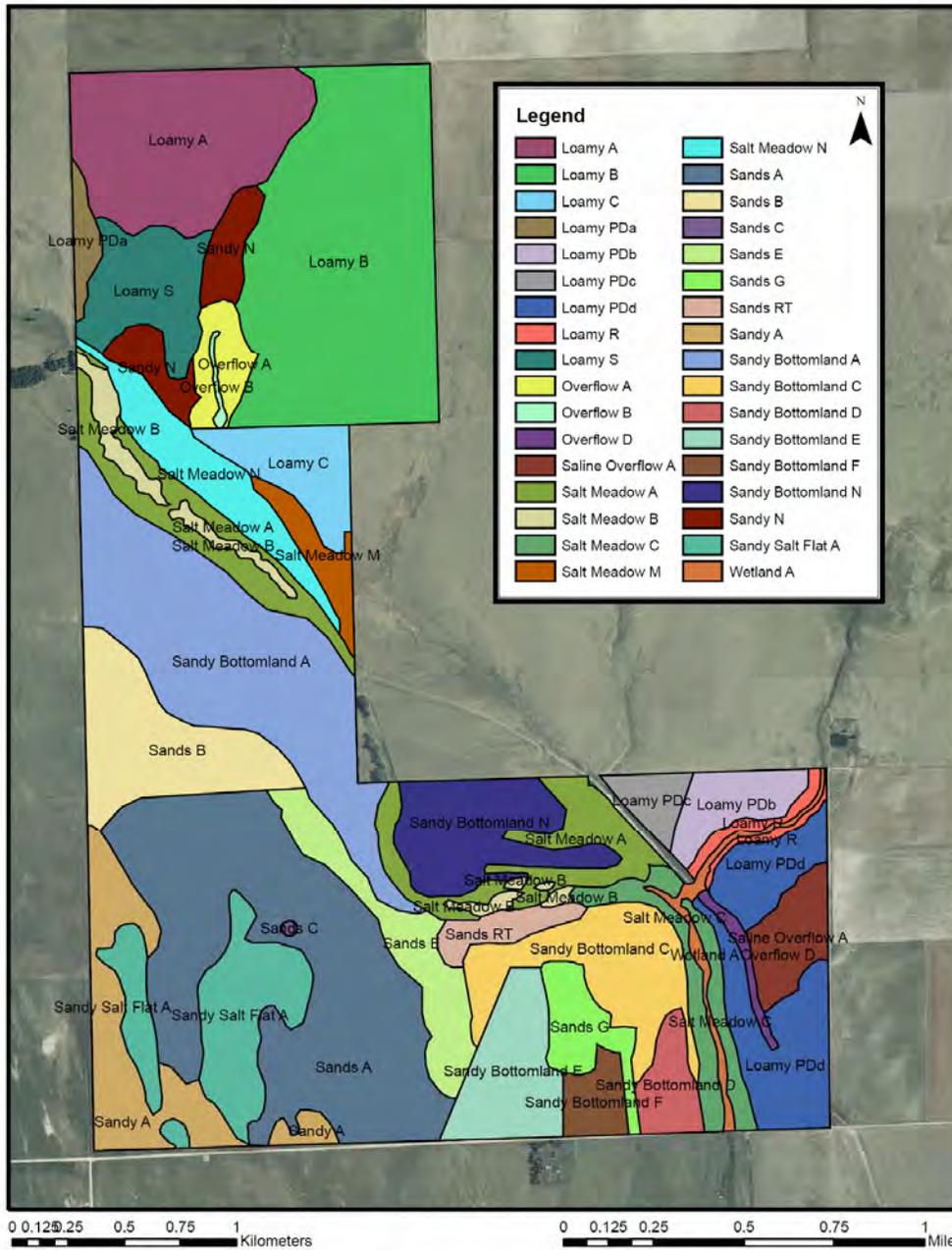
CREATED BY: RACHEL RIDENOUR - 8/9/2006

SOURCE: [HTTP://NRDATA.NPS.GOV/SAND/NRDATA/SOILS/SAND\\_SOIL.SHP](http://NRDATA.NPS.GOV/SAND/NRDATA/SOILS/SAND_SOIL.SHP)

**Figure 129: Sand Creek Massacre Site: Soil Map Units Map** - This map shows the soil map units of the Sand Creek Massacre Site as defined by the 1981 soil survey.



# SAND CREEK MASSACRE SITE: COMMUNITY STRATA 2005



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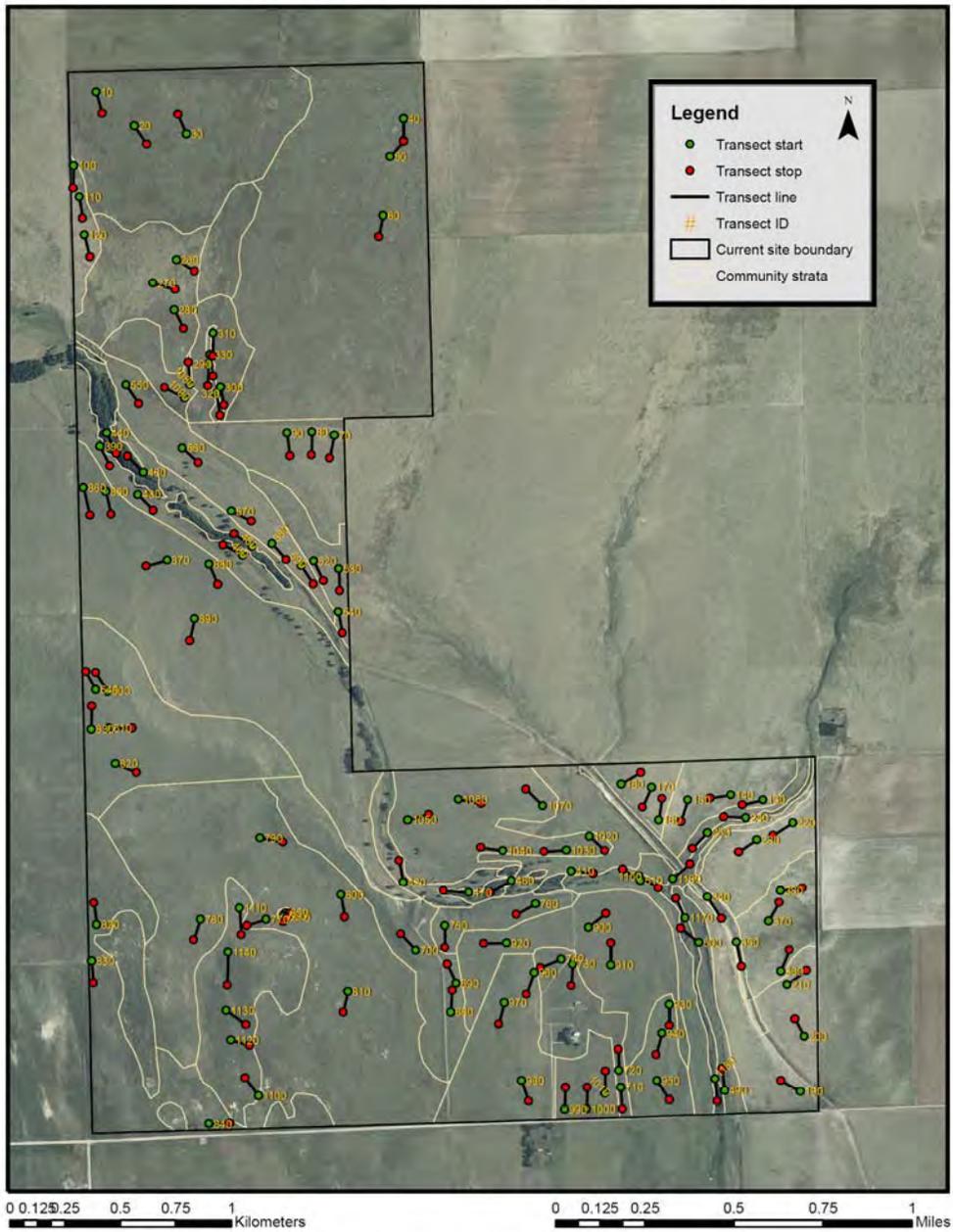
**Figure 130: Sand Creek Massacre Site: Community Strata Map** - This map shows the community strata of the Sand Creek Massacre Site as defined by the 2005 Vegetation Inventory.







## SAND CREEK MASSACRE SITE: TRANSECT LOCATIONS 2005



CREATED BY: RACHEL RIDENOUR - 8/9/2006

**Figure 132: Sand Creek Massacre Site: Transect Locations Map** - This map shows the locations of the transects for the 2005 Vegetation Inventory of the Sand Creek Massacre Site. The key to the transect ID numbers is Table 44.

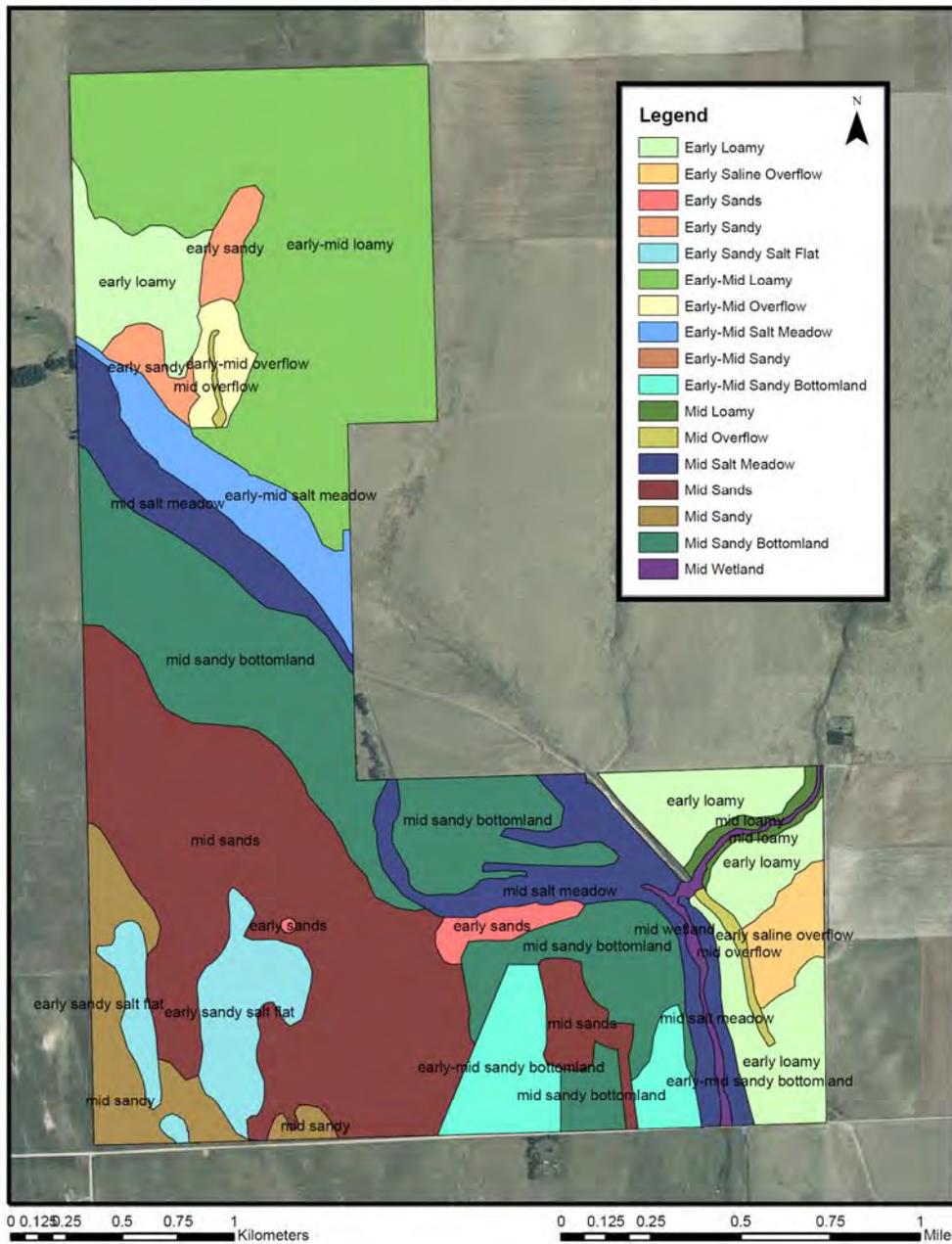


**Table 44: Transect ID Key** - List of transect identification numbers for the Sand Creek Massacre Site: Transect Locations 2005 map.

ID	Transect	ID	Transect	ID	Transect
10	Loamy A 1	410	Salt Meadow A 3	810	SandsA5
20	Loamy A 2	420	Salt Meadow A 4	820	Sandy A 1
30	Loamy A 3	430	Salt Meadow A 5	830	Sandy A 2
40	Loamy B 1	440	Salt Meadow B 1	840	Sandy A 3
50	Loamy B 2	450	Salt Meadow B 2	850	Sandy Bottom A 1
60	Loamy B 3	460	Salt Meadow B 3	860	Sandy Bottom A 2
70	Loamy C 1	470	Salt Meadow B 4	870	Sandy Bottom A 3
80	Loamy C 2	480	Salt Meadow B 5	880	Sandy Bottom A 4
90	Loamy C 3	490	Salt Meadow C 1	890	Sandy Bottom A 5
100	Loamy PDa 1	500	Salt Meadow C 2	900	Sandy Bottom C 1
110	Loamy PDa 2	510	Salt Meadow C 3	910	Sandy Bottom C 2
120	Loamy PDa 3	520	Salt Meadow M 1	920	Sandy Bottom C 3
130	Loamy PDb 1	530	Salt Meadow M 2	930	Sandy Bottom D 1
140	Loamy PDb 2	540	Salt Meadow M 3	940	Sandy Bottom D 2
150	Loamy PDb 3	550	Salt Meadow N 1	950	Sandy Bottom D 3
160	Loamy PDc 1	560	Salt Meadow N 2	960	Sandy Bottom E 1
170	Loamy PDc 2	570	Salt Meadow N 3	970	Sandy Bottom E 2
180	Loamy PDc 3	580	Salt Meadow N 4	980	Sandy Bottom E 3
190	Loamy PDd 1	590	Salt Meadow N 5	990	Sandy Bottom F 1
200	Loamy PDd 2	600	Sands B 1	1000	Sandy Bottom F 2
210	Loamy PDd 3	610	Sands B 2	1010	Sandy Bottom F 3
220	Loamy PDd 4	620	Sands B 3	1020	Sandy Bottom N 1
230	Loamy PDd 5	630	Sands B 4	1030	Sandy Bottom N 2
240	Loamy R 1	640	Sands B 5	1040	Sandy Bottom N 3
250	Loamy R 2	650	Sands C 1	1050	Sandy Bottom N 4
260	Loamy S 1	660	Sands C 2	1060	Sandy Bottom N 5
270	Loamy S 2	670	Sands C 3	1070	Sandy Bottom N 6
280	Loamy S 3	680	Sands E 1	1080	Sandy N 1
290	Overflow A 2	690	Sands E 2	1090	Sandy N 2
300	Overflow A 3	700	Sands E 3	1100	Sandy Salt Flat A 1
310	Overflow A 1	710	Sands G 1	1110	Sandy Salt Flat A 2
320	Overflow B 2	720	Sands G 2	1120	Sandy Salt Flat A 3
330	Overflow B1	730	Sands G 3	1130	Sandy Salt Flat A 4
340	Overflow D 1	740	Sands G 4	1140	Sandy Salt Flat A 5
350	Overflow D 2	750	Sands RT 1	1150	Wetland A 1
360	Saline Overflow A 1	760	Sands RT 2	1160	Wetland A 2
370	Saline Overflow A 2	770	SandsA1	1170	Wetland A 3
380	Saline Overflow A 3	780	SandsA2	1180	Wetland A 4
390	Salt Meadow A 1	790	SandsA3		
400	Salt Meadow A 2	800	SandsA4		



## SAND CREEK MASSACRE SITE: SERAL STRATA 2005

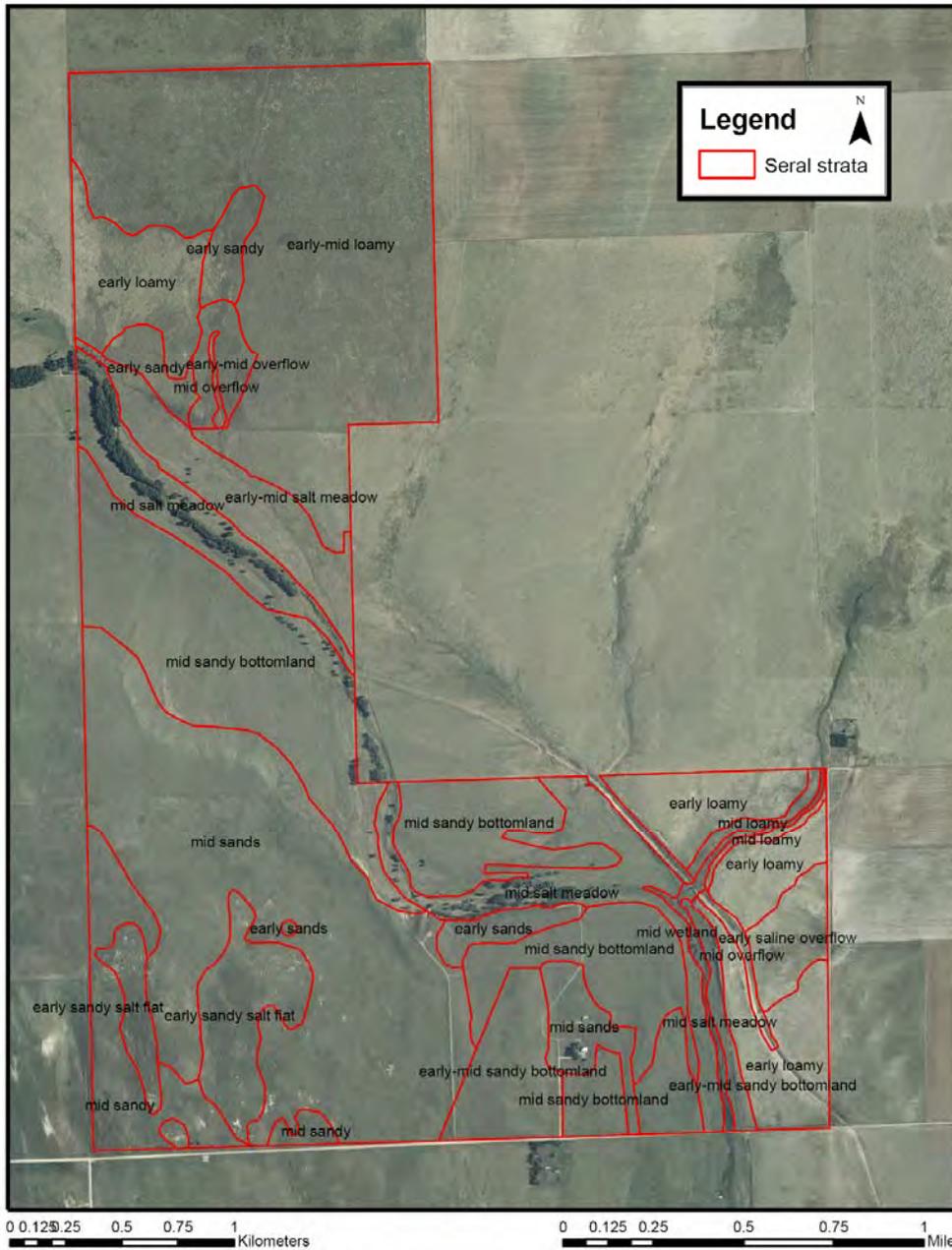


CREATED BY: RACHEL RIDENOUR - 8/9/2006

**Figure 133: Sand Creek Massacre Site: Seral Strata Map** - This map shows the seral strata on the Sand Creek Massacre Site as defined by the 2005 Vegetation Inventory.



# SAND CREEK MASSACRE SITE: SERAL STRATA 2005

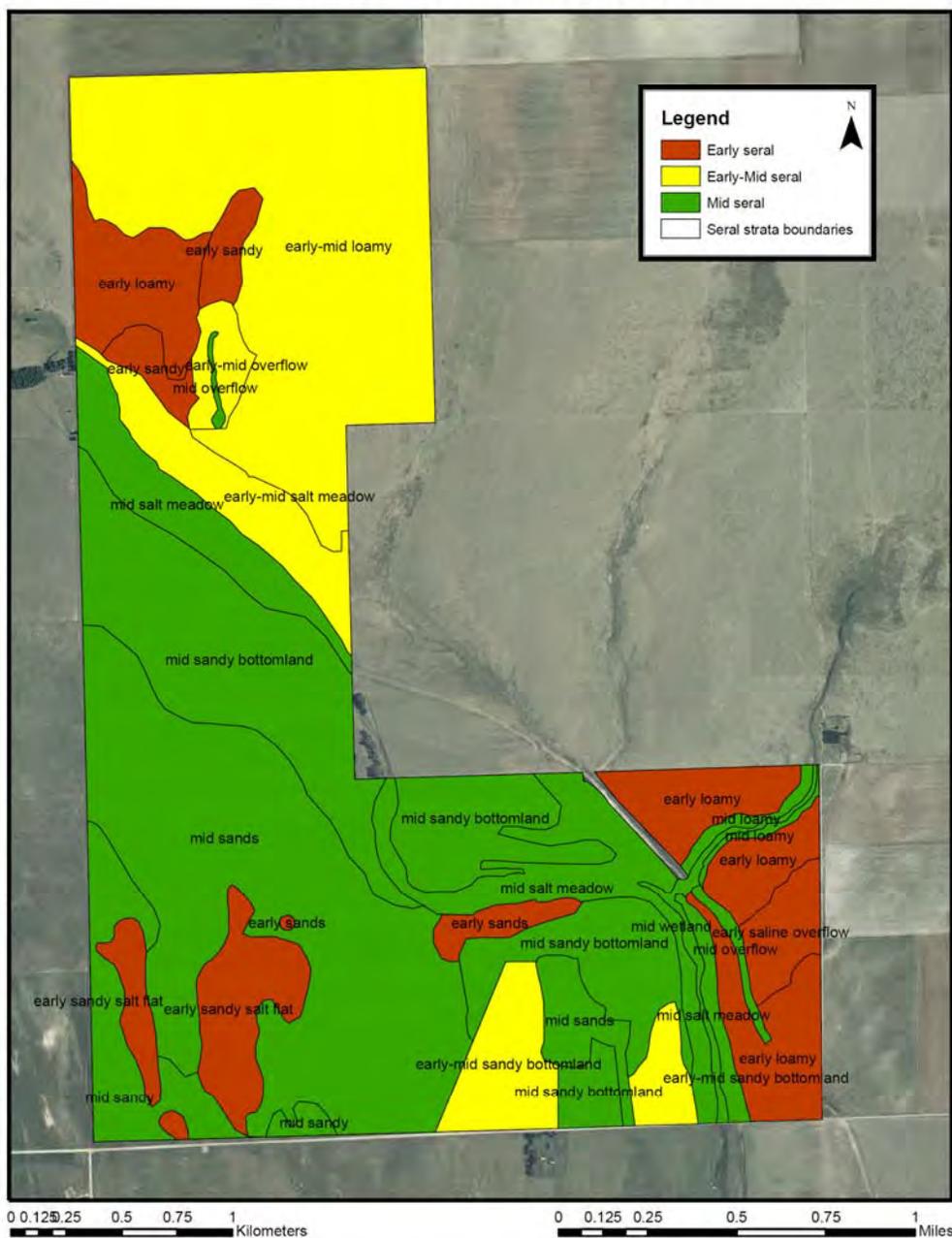


CREATED BY: RACHEL RIDENOUR - 8/9/2006

**Figure 134: Sand Creek Massacre Site: Seral Strata Map (Outline)** - This map shows the seral strata on the Sand Creek Massacre Site as defined by the 2005 Vegetation Inventory.



## SAND CREEK MASSACRE SITE: SERAL STAGES 2005



CREATED BY: RACHEL RIDENOUR - 8/9/2006

**Figure 135: Sand Creek Massacre Site: Seral Stages Map** - This map shows the seral stages on the Sand Creek Massacre Site as defined by the 2005 Vegetation Inventory.



## Appendix B: Wildlife Species List

**Table 45: Wildlife Species List** - List of wildlife species observed on the Sand Creek Massacre Site by the field crew in the summer of 2005.

*Key: n=ative, i=introduced, u=unknown			
<b>WILDLIFE</b>			
Vernacular Name	Scientific Name	Nativity	Type
Golden Eagle	<i>Aquila chrysaetos</i>	n	bird
Ferruginous Hawk	<i>Buteo regalis</i>	n	bird
Nighthawk	<i>Chordeiles sp.</i>	n	bird
Killdeer	<i>Charadrius vociferus</i>	n	bird
Burrowing Owl	<i>Athene cunicularia</i>	n	bird
Mourning Dove	<i>Zenaida macroura</i>	n	bird
Red-Tailed Hawk	<i>Buteo jamaicensis</i>	n	bird
Ringneck Pheasant	<i>Phasianus colchicus</i>	i	bird
whitetail deer	<i>Odocoileus virginianus</i>	n	mammal
mule deer	<i>Odocoileus hemionus</i>	n	mammal
North American porcupine	<i>Erethizon dorsatum</i>	n	mammal
black-tailed jackrabbit	<i>Lepus californicus</i>	n	mammal
cottontail rabbit	<i>Sylvilagus sp.</i>	n	mammal
black-tailed prairie dog	<i>Cynomys ludovicianus</i>	n	mammal
feral hog	<i>Sus scrofa</i>	i	mammal
Great Plains toad	<i>Bufo cognatus</i>	n	amphibian
lesser earless lizard	<i>Holbrookia maculata</i>	n	reptile
box turtle	<i>Terrapene ornata</i>	n	reptile
western rattlesnake	<i>Crotalus viridis</i>	n	reptile
green racer	<i>Coluber constrictor</i>	n	reptile
bull snake	<i>Pituophis catenifer</i>	n	reptile
garter snake	<i>Thamnophis sp.</i>	n	reptile



## Appendix C: Transect Waypoints

**Table 46: Transect Waypoints** - List of the coordinates for the transects on the Sand Creek Massacre Site. Waypoints were collected using the North American Datum of 1983 and are listed as geographic or Universal Transverse Mercator coordinates. Some end points have a bearing listed instead of a coordinate. These end points are located 100 meters from the start point in the direction of the listed bearing.

Transect	Start Point	End Point or Bearing
Loamy A 1	N38° 35.025 W102° 31.640	N38° 34.972 W102° 31.623
Loamy A 2	13 715550E 4273333N	13 715605E 4273249N
Loamy A 3	13 715785E 4273296N	13 715747E 4273386N
Loamy B 1	13 716766E 4273366N	13 716766E 4273266N
Loamy B 2	13 716704E 4273194N	13 716766E 4273263N
Loamy B 3	13 716674E 4272929N	13 716653E 4272832N
Loamy C 1	13 716452E 4271933N	13 716432E 4271831N
Loamy C 2	13 716352E 4271946N	13 716350E 4271844N
Loamy C 3	13 716239E 4271942N	13 716252E 4271840N
Loamy PDa 1	13 715275E 4273153N	13 715273E 4273051N
Loamy PDa 2	13 715302E 4273013N	13 715316E 4272916N
Loamy PDa 3	13 715323E 4272841N	13 715349E 4272741N
Loamy PDb 1	N38° 33.249 W102° 29.626	N38° 33.238 W102° 29.691
Loamy PDb 2	N38° 33.263 W102° 29.725	N38° 33.256 W102° 29.790
Loamy PDb 3	N38° 33.253 W102° 29.859	N38° 33.202 W102° 29.882
Loamy PDC 1	N38° 33.207 W102° 29.952	N38° 33.259 W102° 29.939
Loamy PDC 2	N38° 33.239 W102° 30.001	N38° 33.287 W102° 29.971
Loamy PDC 3	N38° 33.297 W102° 30.065	N38° 33.324 W102° 30.003
Loamy PDD 1	N38° 32.532 W102° 29.534	N38° 32.560 W102° 29.595
Loamy PDD 2	N38° 32.667 W102° 29.517	N38° 32.711 W102° 29.545
Loamy PDD 3	N38° 32.794 W102° 29.567	N38° 32.828 W102° 29.504
Loamy PDD 4	N38° 33.191 W102° 29.535	N38° 33.162 W102° 29.597
Loamy PDD 5	N38° 33.152 W102° 29.648	N38° 33.123 W102° 29.706
Loamy R 1	13 718313E 4270199N	274°
Loamy R 2	13 718139E 4270131N	232°
Loamy S 1	13 715739E 4272727N	13 715821E 4272676N
Loamy S 2	13 715634E 4272621N	13 715733E 4272593N
Loamy S 3	13 715730E 4272499N	13 715772E 4272413N
Overflow A 1	13 715906E 4272393N	13 715903E 4272291N
Overflow A 2	13 715886E 4272255N	13 715882E 4272156N
Overflow A 3	13 715938E 4272150N	180°
Overflow B 1	13 715892E 4272297N	13 715905E 4272198N
Overflow B 2	13 715921E 4272121N	13 715936E 4272022N

Overflow D 1	13 718140E 4269839N	157°
Overflow D 2	13 718271E 4269634N	166°
Saline Overflow A 1	N38°32.332 W102°29.597	N38°32.879 W102°29.557
Saline Overflow A 2	N38°32.951 W102°29.619	N38°32.996 W102°29.585
Saline Overflow A 3	N38°33.025 W102°29.580	N38°33.030 W102°29.511
Salt Meadow A 1	13 715039E 4271881N	156°
Salt Meadow A 2	13 716039E 4271387N	313°
Salt Meadow A 3	13 717524E 4269957N	95°
Salt Meadow A 4	13 716764E 4269906N	353°
Salt Meadow A 5	13 715565E 4271663N	140°
Salt Meadow B 1	13 715425E 4271943N	162°
Salt Meadow B 2	13 716083E 4271428N	299°
Salt Meadow B 3	13 717254E 4269914N	252°
Salt Meadow B 4	13 717062E 4269859N	274°
Salt Meadow B 5	13 715591E 4271764N	314°
Salt Meadow C 1	13 718217E 4268962N	354°
Salt Meadow C 2	13 718101E 4269631N	358°
Salt Meadow C 3	13 717836E 4269915N	311°
Salt Meadow M 1	13 716360E 4271360N	13 716403E 4271272N
Salt Meadow M 2	13 716473E 4271327N	13 716478E 4271228N
Salt Meadow M 3	13 716471E 4271132N	13 716489E 4271037N
Salt Meadow N 1	13 715513E 4272160N	13 715570E 4272075N
Salt Meadow N 2	13 715767E 4271875N	13 715838E 4271809N
Salt Meadow N 3	13 715987E 4271587N	13 716077E 4271542N
Salt Meadow N 4	13 716173E 4271440N	13 716236E 4271366N
Salt Meadow N 5	13 716304E 4271341N	13 716359E 4271258N
Sands B 1	N38° 33.558 W102° 31.655	N38° 33.605 W102° 31.690
Sands B 2	N38° 33.468 W102° 31.653	N38° 33.466 W102° 31.581
Sands B 3	N38° 33.380 W102° 31.636	N38° 33.357 W102° 31.571
Sands B 4	N38° 33.466 W102° 31.708	N38° 33.522 W102° 31.705
Sands B 5	N38° 33.563 W102° 31.691	N38° 33.608 W102° 31.721
Sands C 1	N38° 33.003 W102° 31.119	N38° 33.002 W102° 31.108
Sands C 2	N38° 32.996 W102° 31.125	N38° 32.983 W102° 31.128
Sands C 3	N38° 32.993 W102° 31.114	N38° 32.990 W102° 31.118
Sands E 1	13 716697E 4269317N	13 716986E 4269416N
Sands E 2	13 717004E 4269448N	13 716964E 4269536N
Sands E 3	13 716821E 4269597N	13 716753E 4269670N
Sands G 1	13 717747E 4268977N	13 717754E 4268877N
Sands G 2	13 717739E 4269054N	13 717737E 4269150N
Sands G 3	13 717530E 4219536N	13 717525E 4269436N

Sands G 4	13 715781E 4269965N	13 717385E 4269518N
Sands RT 1	13 716952E 4269710N	13 716952E 4209609N
Sands RT 2	13 717363E 4269807N	13 717276E 4269100N
SandsA1	N38° 32.989 W102° 31.180	N38° 32.975 W102° 31.242
SandsA2	N38° 32.994 W102° 31.385	N38° 32.943 W102° 31.407
SandsA3	N38° 33.189 W102° 31.113	N38° 33.177 W102° 31.121
SandsA4	N38° 33.044 W102° 30.946	N38° 32.990 W102° 30.936
SandsA5	N38° 32.807 W102° 30.933	N38° 32.757 W102° 30.949
Sandy A 1	13 715379E 4269713N	13 715366E 4269811N
Sandy A 2	13 715357E 4269549N	13 715365E 4269450N
Sandy A 3	13 715887E 4268811N	13 715981E 4268812N
Sandy N 1	13 715799E 4272161N	13 715794E 4272263N
Sandy N 2	13 715777E 4272102N	13 715686E 4272148N
Sandy Bottom A 1	N38° 34.047 W102° 31.643	N38° 34.057 W102° 31.712
Sandy Bottom A 2	N38° 33.990 W102° 31.629	N38° 33.989 W102° 31.695
Sandy Bottom A 3	N38° 33.875 W102° 31.458	N38° 33.862 W102° 31.524
Sandy Bottom A 4	N38° 33.862 W102° 31.328	N38° 33.813 W102° 31.303
Sandy Bottom A 5	N38° 33.730 W102° 31.378	N38° 33.677 W102° 31.395
Sandy Bottom C 1	13 717602E 4269702N	13 717680E 4269764N
Sandy Bottom C 2	13 717702E 4269529N	13 717600E 4269704N
Sandy Bottom C 3	13 717602E 4269702N	13 717680E 4269764N
Sandy Bottom D 1	13 717967E 4269353N	13 717966E 4269256N
Sandy Bottom D 2	13 717934E 4269222N	13 717908E 4269125N
Sandy Bottom D 3	13 717911E 4269006N	13 717966E 4268291N
Sandy Bottom E 1	13 717356E 4269496N	13 717322E 4269398N
Sandy Bottom E 2	13 717222E 4269362N	13 717196E 4269262N
Sandy Bottom E 3	13 717300E 4269006N	13 717332E 4268914N
Sandy Bottom F 1	13 717494E 4268876N	13 717497E 4268977N
Sandy Bottom F 2	13 717594E 4268877N	13 717596E 4268977N
Sandy Bottom F 3	13 717677E 4268949N	13 717679E 4269050N
Sandy Bottom N 1	N38°33.171 W102°30.169	N38°35.135 W102°30.121
Sandy Bottom N 2	N38°33.139 W102°30.241	N38°33.137 W102°30.310
Sandy Bottom N 3	N38°33.142 W102°30.439	N38°33.151 W102°30.507
Sandy Bottom N 4	N38°33.223 W102.30.732	N38°33.335 W102°30.666
Sandy Bottom N 5	N38°33.270 W102°30.572	N38°33.258 W102°30.502
Sandy Bottom N 6	13 717395E 4270253N	13 717320E 4270329N
Sandy Salt Flat A 1	13 716110E 4268940N	13 716049E 4269019N
Sandy Salt Flat A 2	13 716024E 4269789N	13 716069E 4269167N
Sandy Salt Flat A 3	13 715985E 4269191N	13 716054E 4269260N
Sandy Salt Flat A 4	13 715965E 4269327N	13 715970E 4269439N

Sandy Salt Flat A 5	13 715974E 4269588N	13 716033E 4269667N
Wetland A 1	13 717830E 4269934N	112°
Wetland A 2	13 717984E 4269922N	47°
Wetland A 3	13 718039E 4269744N	334°
Wetland A 4	13 718173E 4269014N	170°

## **Appendix D: Plant Species List**

- I** - Forbs by Scientific Name
- II** - Forbs by Vernacular Name
- III** - Graminoids by Scientific Name
- IV** - Graminoids by Vernacular Name
- V** - Shrubs by Scientific Name
- VI** - Shrubs by Vernacular Name



## **I - Forbs by Scientific Name**

Table 47: Forbs by Scientific Name - Forb species observed on the Sand Creek Massacre Site in 2005 & 2006. Species are listed by scientific

Scientific Name	Vernacular Name	Authors	Type	Growth Habit	Nativity	Original Identification	Updated by
<i>Abronia fragrans</i>	snowball sand verbena	Nutt. ex Hook.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Amaranthus retroflexus</i>	redroot pigweed	L.	f	a	n	GPFA 1986	USDA, NRCS 2006
<i>Ambrosia psilostachya</i>	western ragweed	DC.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Apocynum cannabinum</i>	Indianhemp dogbane	L.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Argemone polyanthemos</i>	prickly poppy	(Fedde) G.B. Ombey	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Artemisia ludoviciana</i>	Louisiana sagewort	Nutt.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Asclepia subverticillata</i>	poison milkweed	(A. Gray) Vail	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Asclepias engelmanniana</i>	Engelmann's milkweed	Woods.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Asclepias latifolia</i>	broadleaf milkweed	(Torr.) Raf.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Asclepias speciosa</i>	showy milkweed	Torr.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Asclepias viridiflora</i>	green milkweed	Raf.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Aster sp.</i>	Aster sp.	L.	f	u	u	GPFA 1986	USDA, NRCS 2006
<i>Astragalus bodinii</i>	Bodin's milkvech	Sheldon	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Astragalus ceramicus var. filifolius</i>	painted milkvetch	Sheldon (A. Gray) F. J. Herm.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Astragalus crassicaarpus</i>	groundplum milkvetch	Nutt.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Astragalus miser</i>	timber milkvetch	Dougl.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Astragalus missouriensis</i>	Missouri milkvetch	Nutt.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Astragalus mollissimus</i>	woolly locoweed	Torr.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Astragalus pectinatus</i>	narrowleaf poisonvetch	(Dougl. ex Hook.) Dougl. ex G. Don	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Astragalus praelongus var. ellisiae</i>	stinking milkvetch	Sheldon (Rydb.) Bameby	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Astragalus purshii</i>	woollypod milkvetch	Dougl. ex Hook.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Astragalus sp.</i>	Astragalus sp.	L.	f	u	u	GPFA 1986	USDA, NRCS 2006
<i>Astragalus sp.</i>	Astragalus sp. #2	L.	f	u	u	GPFA 1986	USDA, NRCS 2006
<i>Astragalus sp.</i>	Astragalus sp. #3	L.	f	u	u	GPFA 1986	USDA, NRCS 2006
<i>Astragalus sp.</i>	Astragalus sp. #4	L.	f	u	u	GPFA 1986	USDA, NRCS 2006
<i>Astragalus sp.</i>	Astragalus sp. #5	L.	f	u	u	GPFA 1986	USDA, NRCS 2006
<i>Astragalus sp.</i>	Astragalus sp. #6	L.	f	u	u	GPFA 1986	USDA, NRCS 2006
Brassicaceae	UF99		f	u	u	GPFA 1986	USDA, NRCS 2006
<i>Caesalpinia jamesii</i>	James rushpea	(Torr. & A. Gray) Fisher	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Callirhoe involucrata</i>	winecup	(Torr. & Gray) Gray	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Calylophus serrulatus</i>	plains yellow primrose	(Nutt.) Raven	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Chamaesyce serpyllifolia ssp. serpyllifolia</i>	thyme-leaved spurge	(Pers.) Small	f	a	n	GPFA 1986	USDA, NRCS 2006
Chenopodiaceae	UF10		f	u	u	GPFA 1986	USDA, NRCS 2006
<i>Chenopodium album</i>	lambquarters	L.	f	a	n	GPFA 1986	USDA, NRCS 2006
<i>Chenopodium sp.</i>	Chenopodium sp. #1	L.	f	a	u	GPFA 1986	USDA, NRCS 2006

Key: f=forb, g=graminoid, s=shrub, t=tree, a=annual, p=perennial, i=introduced, n=ative, u=unknown

## FORBS BY SCIENTIFIC NAME

Scientific Name	Vernacular Name	Authors	Type	Growth Habit	Nativity	Original Identification	Updated by
<i>Chenopodium sp.</i>	Chenopodium sp. #2	L.	f	a	u	GPFA 1986	USDA, NRCS 2006
<i>Chenopodium sp.</i>	Chenopodium sp.	L.	f	a	u	GPFA 1986	USDA, NRCS 2006
<i>Chenopodium watsonii</i>	Chenopodium watsonii	A. Nelson	f	a	n	GPFA 1986	USDA, NRCS 2006
<i>Cirsium undulatum</i>	wayleaf thistle	(Nutt.) Spreng.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Convolvulus arvensis</i>	field bindweed	L.	f	a	i	GPFA 1986	USDA, NRCS 2006
<i>Conyza canadensis</i>	conyza	(L.) Cronq.	f	a	n	GPFA 1986	USDA, NRCS 2006
<i>Croton texensis</i>	Texas croton	(Klotzsch) Muell.-Arg.	f	a	n	GPFA 1986	USDA, NRCS 2006
<i>Cryptantha circumscissa</i>	beggars tick	(Hook. & Arn.) I.M. Johnston	f	a	n	GPFA 1986	USDA, NRCS 2006
<i>Cucurbita foetidissima</i>	buffalo-gourd	Kunth	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Dalea aurea</i>	Golden prairie clover	Nutt. ex Pursh	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Dalea candida</i>	white prairie clover	Michx. ex Willd.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Dalea enneandra</i>	bigtop dalea	Nutt.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Dalea purpurea</i>	purple prairie clover	Vent.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Dalea sp.</i>	Dalea sp. #1	Lucanus	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Dalea villosa</i>	silky prairie clover	(Nutt.) Spreng.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Delphinium virens</i>	Plains larkspur	Nutt.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Diracopsis sp.</i>	coneflower	Cass.	f	u	u	GPFA 1986	USDA, NRCS 2006
<i>Dyssodia papposa</i>	fetid marigold	(Vent.) Hitchc.	f	a	n	GPFA 1986	USDA, NRCS 2006
<i>Engelmannia pinnatifida</i>	Engelmanns daisy	Nutt. ex Nutt	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Equisetum hyemale</i>	horsetail	L.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Erigeron bellidiastrum</i>	western fleabane	Nutt.	f	a	n	GPFA 1986	USDA, NRCS 2006
<i>Erigeron compositus</i>	cutleaf daisy	Pursh	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Erigeron glabellus subsp. pubescens</i>	streamside fleabane	Nutt. (Hook.) Cronq.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Erigeron modestus</i>	plains fleabane	Gray	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Eriogonum annuum</i>	annual buckwheat	Nutt.	f	a	n	GPFA 1986	USDA, NRCS 2006
<i>Erysimum asperum</i>	wallflower	(Nutt.) DC.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Euphorbia marginata</i>	snow on the mountain	Pursh	f	a	n	GPFA 1986	USDA, NRCS 2006
<i>Evolvulus nuttallianus</i>	Nuttalls evolvulus	Roem. & Schult.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Fabaceae</i>	UF12		f	u	u	GPFA 1986	USDA, NRCS 2006
<i>Gaillardia pulchella</i>	blanket flower	Foug.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Gaura coccinea</i>	scarlet gaura	Nutt. ex Pursh	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Gaura parviflora</i>	velvet gaura	Dougl. ex Lehm.	f	a	n	GPFA 1986	USDA, NRCS 2006
<i>Glycyrrhiza lepidota</i>	American licorice	Pursh	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Grindelia squarrosa</i>	curlycup gumweed	(Pursh) Dunal	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Haplopappus spinulosus</i>	ironplant goldenweed	(Nutt.) A. Gray	f	p	n	GPFA 1986	USDA, NRCS 2006

Key: f=forb, g=graminoid, s=shrub, t=tree, a=annual, p=perennial, i=introduced, n=native, u=unknown

## FORBS BY SCIENTIFIC NAME

Scientific Name	Vernacular Name	Authors	Type	Growth Habit	Nativity	Original Identification	Updated by
<i>Helianthus annuus</i>	common sunflower	L.	f	a	n	GPFA 1986	USDA, NRCS 2006
<i>Heterotheca villosa</i>	hairy goldenaster	(Pursh) Shimmers	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Hymenopappus</i> sp.		L'Her.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Ipomoea leptophylla</i>	bush morning glory	Torr.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Ipomopsis longiflora</i>	flaxflowered ipomopsis	(Torr.) V. Grant	f	a	n	GPFA 1986	USDA, NRCS 2006
<i>Iva axillaris</i>	povertyweed	Pursh	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Kochia scoparia</i>	kochia	(L.) Schrad.	f	a	i	GPFA 1986	USDA, NRCS 2006
<i>Lactuca scariola</i>	prickly lettuce	L.	f	a	i	GPFA 1986	USDA, NRCS 2006
<i>Lappula echinata</i> var. <i>occidentalis</i>	flatspine stitkseed	Gilib. (S. Wats.) Bolvin	f	a	n	GPFA 1986	USDA, NRCS 2006
<i>Lepidium densiflorum</i>	pepperpod mustard	Schrad.	f	a	n	GPFA 1986	USDA, NRCS 2006
<i>Liatis punctata</i>	dotted gayfeather	Hook.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Linaria vulgaris</i>	yellow toadflax	P. Mill.	f	p	i	GPFA 1986	USDA, NRCS 2006
<i>Linum rigidum</i>	stiff flax	Pursh	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Linum</i> sp.	Linum sp.	L.	f	u	u	GPFA 1986	USDA, NRCS 2006
<i>Lippia cuneifolia</i>	frog fruit	(Torr.) Steud.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Lithospermum incisum</i>	narrowleaf stoneseed	Lehm.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Lupinus pusillus</i>	small lupine	Pursh	f	a	n	GPFA 1986	USDA, NRCS 2006
<i>Lygodesmia juncea</i>	rush skeletonplant	(Pursh) D. Don ex Hook.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Melilotus alba</i>	white sweetclover	Medik.	f	p	i	GPFA 1986	USDA, NRCS 2006
<i>Melilotus officinalis</i>	yellow sweetclover	(L.) Lam.	f	p	i	GPFA 1986	USDA, NRCS 2006
<i>Mentzelia decapetala</i>	stickleleaf mentzilia	(Pursh ex Sims) Urban & Gilg ex Gilg	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Mirabilis hirsuta</i>	hairy fourclock	(Pursh) MacMill.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Mirabilis linearis</i>	narrowleaf fourclock	(Pursh) Heimerl	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Oenothera albicaulis</i>	pale evening-primrose	Pursh	f	a	n	GPFA 1986	USDA, NRCS 2006
<i>Oenothera coronopifolia</i>	cutleaf evening-primrose	Torr. & A. Gray	f	a	n	GPFA 1986	USDA, NRCS 2006
<i>Oenothera harringtonii</i>	Colorado Springs evening-primrose	W.L. Wagner	f	a	n	GPFA 1986	USDA, NRCS 2006
<i>Oenothera</i> spp.	evening-primrose	L.	f	a	n	GPFA 1986	USDA, NRCS 2006
<i>Oxytropis campestris</i>	field locoweed	(L.) DC.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Oxytropis sericea</i>	silky crazyweed	Nutt.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Oxytropis</i> sp.	Oxytropis sp.	DC.	f	p	u	GPFA 1986	USDA, NRCS 2006
<i>Oxytropis</i> sp.	UJF8	DC.	f	p	u	GPFA 1986	USDA, NRCS 2006
<i>Packera neomexicana</i> var. <i>mutabilis</i>	variable senecio	(Gray) W.A. Weber & A. Love (Greene) W.A. Weber & A. Love	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Packera</i> sp.	Packera sp.	A. Love & D. Löve	f	u	u	GPFA 1986	USDA, NRCS 2006
<i>Palafoxia sphacelata</i>	othake	(Torr.) Cory	f	a	n	GPFA 1986	USDA, NRCS 2006
<i>Penstemon albidus</i>	white beardtongue	Nutt.	f	p	n	GPFA 1986	USDA, NRCS 2006

Scientific Name	Vernacular Name	Authors	Type	Growth Habit	Nativity	Original Identification	Updated by
<i>Penstemon</i> spp.	penstemons	Mitchell	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Physalis heterophylla</i>	clammy groundcherry	Nees	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Physalis longifolia</i>	common groundcherry	Nutt.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Physalis purilla</i>	prairie groundcherry	Nutt.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Plantago patagonica</i>	woolly Indianwheat	Jacq.	f	a	n	GPFA 1986	USDA, NRCS 2006
<i>Polanisia dodecandra</i> ssp. <i>trachysperma</i>	clammy weed	(L.) DC. (Torr. & Gray) Ilitis	f	a	n	GPFA 1986	USDA, NRCS 2006
<i>Portulaca oleracea</i>	purselane	L.	f	a	i	GPFA 1986	USDA, NRCS 2006
<i>Psoralea argophylla</i>	silverleaf scurfspea	Pursh.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Psoralea digitata</i>	palmleaf scurfspea	Nutt. ex Torr. & A. Gray	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Psoralea lanceolatum</i>	lemon scurfspea	(Pursh) Rydb.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Psoraleidium tenuiflorum</i>	slimflower scurfspea	(Pursh) Rydb.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Quincula lobata</i>	purple ground cherry	(Torr.) Raf.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Ratibida columnifera</i>	prairie coneflower	(Nutt.) Wood. and Standl.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Ratibida tagetes</i>	short-ray prairie coneflower	(James) Barnh.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Rumex altissimus</i>	pale dock	(L.) Alph. Wood	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Rumex crispus</i>	curly dock	L.	f	p	i	GPFA 1986	USDA, NRCS 2006
<i>Salsola iberica</i>	Russian thistle	L.	f	a	i	GPFA 1986	USDA, NRCS 2006
<i>Senecio integerrimus</i>	groundsel	Nutt.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Solanum rostratum</i>	buffalo bur	Dunal	f	a	n	GPFA 1986	USDA, NRCS 2006
<i>Solidago gigantea</i>	late goldenrod	Alton	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Sophora nuttalliana</i>	silky sophora	B.L. Turner	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Sphaeralcea coccinea</i>	scarlet globemallow	(Nutt.) Rydb.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Symphotrichum ericoides</i>	heath aster	(L.) Nesom	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Talinum parviflorum</i>	fame flower	Nutt.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Thelesperma megapotamicum</i>	Hopi tea greenthread	(Sprengel) O. Kuntze	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Tradescantia occidentalis</i>	prairie spiderwort	(Britton) Smyth	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Tragopogon dubius</i>	salsify	Scop.	f	a	i	GPFA 1986	USDA, NRCS 2006
<i>Verbena bracteata</i>	prostrate vervain	Cav. ex Lag. & Rodr.	f	p	n	GPFA 1986	USDA, NRCS 2006
<i>Veronica officinalis</i>	common speedwell	L.	f	p	n	GPFA 1986	USDA, NRCS 2006
	UF20		f	u	u		
	UF24		f	u	u		
	UF25		f	u	u		



## **III - Forbs by Vernacular Name**

**Table 48: Graminoids by Scientific Name - Graminoid species observed on the Sand Creek Massacre Site in 2005 & 2006. Species are listed by**

**Key:** f=forb, g=graminoid, s=shrub, t=tree, a=annual, p=perennial, i=introduced, n=native, u=unknown

**FORBS BY VERNACULAR NAME**

Vernacular Name	Scientific Name	Authors	Type	Growth Habit	Nativity	Original Identification	Updated by
American licorice	<i>Glycyrrhiza lepidota</i>	Pursh	f	p	n	GPFA 1986	USDA, NRCS 2006
annual buckwheat	<i>Eriogonum annuum</i>	Nutt.	f	a	n	GPFA 1986	USDA, NRCS 2006
Aster sp.	<i>Aster sp.</i>	L.	f	u	u	GPFA 1986	USDA, NRCS 2006
Astragalus sp.	<i>Astragalus sp.</i>	L.	f	u	u	GPFA 1986	USDA, NRCS 2006
Astragalus sp. #2	<i>Astragalus sp.</i>	L.	f	u	u	GPFA 1986	USDA, NRCS 2006
Astragalus sp. #3	<i>Astragalus sp.</i>	L.	f	u	u	GPFA 1986	USDA, NRCS 2006
Astragalus sp. #4	<i>Astragalus sp.</i>	L.	f	u	u	GPFA 1986	USDA, NRCS 2006
Astragalus sp. #5	<i>Astragalus sp.</i>	L.	f	u	u	GPFA 1986	USDA, NRCS 2006
Astragalus sp. #6	<i>Astragalus sp.</i>	L.	f	u	u	GPFA 1986	USDA, NRCS 2006
beggars tick	<i>Cryptantha circumscissa</i>	(Hook. & Arn.) I.M. Johnston	f	a	n	GPFA 1986	USDA, NRCS 2006
bigtop dailea	<i>Dailea enneandra</i>	Nutt.	f	p	n	GPFA 1986	USDA, NRCS 2006
blanket flower	<i>Gaillardia pulchella</i>	Foug.	f	p	n	GPFA 1986	USDA, NRCS 2006
Bodin's milkvech	<i>Astragalus bodinii</i>	Sheldon	f	p	n	GPFA 1986	USDA, NRCS 2006
broadleaf milkweed	<i>Asclepias latifolia</i>	(Torr.) Raf.	f	p	n	GPFA 1986	USDA, NRCS 2006
buffalo bur	<i>Solanum rostratum</i>	Dunal	f	a	n	GPFA 1986	USDA, NRCS 2006
buffalo-gourd	<i>Cucurbita foetidissima</i>	Kunth	f	p	n	GPFA 1986	USDA, NRCS 2006
bush morning glory	<i>Ipomoea leptophylla</i>	Torr.	f	p	n	GPFA 1986	USDA, NRCS 2006
Chenopodium sp. #1	<i>Chenopodium sp.</i>	L.	f	a	u	GPFA 1986	USDA, NRCS 2006
Chenopodium sp. #2	<i>Chenopodium sp.</i>	L.	f	a	u	GPFA 1986	USDA, NRCS 2006
Chenopodium watsonii	<i>Chenopodium watsonii</i>	A. Nelson	f	a	n	GPFA 1986	USDA, NRCS 2006
Chenopodium sp.	<i>Chenopodium sp.</i>	L.	f	a	u	GPFA 1986	USDA, NRCS 2006
clammy groundcherry	<i>Physalis heterophylla</i>	Nees	f	p	n	GPFA 1986	USDA, NRCS 2006
clammy weed	<i>Polanisia dodecandra ssp. trachysperma</i>	(L.) DC. (Torr. & Gray) Iltis	f	a	n	GPFA 1986	USDA, NRCS 2006
Colorado Springs evening-primrose	<i>Oenothera harringtonii</i>	W.L. Wagner	f	a	n	GPFA 1986	USDA, NRCS 2006
common groundcherry	<i>Physalis longifolia</i>	Nutt.	f	p	n	GPFA 1986	USDA, NRCS 2006
common speedwell	<i>Veronica officinalis</i>	L.	f	p	n	GPFA 1986	USDA, NRCS 2006
common sunflower	<i>Helianthus annuus</i>	L.	f	a	n	GPFA 1986	USDA, NRCS 2006
coneflower	<i>Dracopis sp.</i>	Cass.	f	u	u	GPFA 1986	USDA, NRCS 2006
conyza	<i>Conyza canadensis</i>	(L.) Cronq.	f	a	n	GPFA 1986	USDA, NRCS 2006
curly dock	<i>Rumex crispus</i>	L.	f	p	i	GPFA 1986	USDA, NRCS 2006
curlycup gumweed	<i>Grindelia squarrosa</i>	(Pursh) Dunal	f	p	n	GPFA 1986	USDA, NRCS 2006
cutleaf daisy	<i>Erigeron compositus</i>	Pursh	f	p	n	GPFA 1986	USDA, NRCS 2006
cutleaf evening-primrose	<i>Oenothera coronopifolia</i>	Torr. & A. Gray	f	a	n	GPFA 1986	USDA, NRCS 2006
ironplant goldenweed	<i>Haplopappus spinulosus</i>	(Nutt.) A. Gray	f	p	n	GPFA 1986	USDA, NRCS 2006
Dalea sp. #1	<i>Dalea sp.</i>	Lucanus	f	p	n	GPFA 1986	USDA, NRCS 2006

Key: f=forb, g=graminoid, s=shrub, t=tree, a=annual, p=perennial, i=introduced, n=ative, u=unknown

## FORBS BY VERNACULAR NAME

Vernacular Name	Scientific Name	Authors	Type	Growth Habit	Nativity	Original Identification	Updated by
dotted gayfeather	<i>Liatis punctata</i>	Hook.	f	p	n	GPFA 1986	USDA, NRCS 2006
Engelmanns daisy	<i>Engelmannia pinnatifida</i>	Nutt. ex Nutt	f	p	n	GPFA 1986	USDA, NRCS 2006
Engelmann's milkweed	<i>Asclepias engelmanniana</i>	Woods.	f	p	n	GPFA 1986	USDA, NRCS 2006
evening-primrose	<i>Oenothera</i> spp.	L.	f	a	n	GPFA 1986	USDA, NRCS 2006
fame flower	<i>Talinum parviflorum</i>	Nutt.	f	p	n	GPFA 1986	USDA, NRCS 2006
fetid marigold	<i>Dyssodia papposa</i>	(Vent.) Hitchc.	f	a	n	GPFA 1986	USDA, NRCS 2006
field bindweed	<i>Convolvulus arvensis</i>	L.	f	a	i	GPFA 1986	USDA, NRCS 2006
field locoweed	<i>Oxytropis campestris</i>	(L.) DC.	f	p	n	GPFA 1986	USDA, NRCS 2006
flatspine stickseed	<i>Lappula echinata</i> var. <i>occidentalis</i>	Gilib. (S. Wats.) Boivin	f	a	n	GPFA 1986	USDA, NRCS 2006
flaxflowered ipomopsis	<i>Ipomopsis longiflora</i>	(Torr.) V. Grant	f	a	n	GPFA 1986	USDA, NRCS 2006
frog fruit	<i>Lippia cuneifolia</i>	(Torr.) Steud.	f	p	n	GPFA 1986	USDA, NRCS 2006
Golden prairie clover	<i>Dalea aurea</i>	Nutt. ex Pursh	f	p	n	GPFA 1986	USDA, NRCS 2006
green milkweed	<i>Asclepias viridiflora</i>	Raf.	f	p	n	GPFA 1986	USDA, NRCS 2006
groundplum milkvetch	<i>Astragalus crassicaarpus</i>	Nutt.	f	p	n	GPFA 1986	USDA, NRCS 2006
groundsel	<i>Senecio integerrimus</i>	Nutt.	f	p	n	GPFA 1986	USDA, NRCS 2006
hairy fourclock	<i>Mirabilis hirsuta</i>	(Pursh) MacMill.	f	p	n	GPFA 1986	USDA, NRCS 2006
hairy goldenaster	<i>Heterotheca villosa</i>	(Pursh) Shinners	f	p	n	GPFA 1986	USDA, NRCS 2006
heath aster	<i>Symphyotrichum ericoides</i>	(L.) Nesom	f	p	n	GPFA 1986	USDA, NRCS 2006
Hopi tea greenthread	<i>Thelesperma megapotaemicum</i>	(Sprengel) O. Kuntze	f	p	n	GPFA 1986	USDA, NRCS 2006
horsetail	<i>Equisetum hyemale</i>	L.	f	p	n	GPFA 1986	USDA, NRCS 2006
Hymenopappus sp.	<i>Hymenopappus</i> sp.	L'Her.	f	p	n	GPFA 1986	USDA, NRCS 2006
Indianhemp dogbane	<i>Apocynum cannabinum</i>	L.	f	p	n	GPFA 1986	USDA, NRCS 2006
James rushpea	<i>Caesalpinia jamesii</i>	(Torr. & A. Gray) Fisher	f	p	n	GPFA 1986	USDA, NRCS 2006
kochia	<i>Kochia scoparia</i>	(L.) Schrad.	f	a	i	GPFA 1986	USDA, NRCS 2006
lambquarters	<i>Chenopodium album</i>	L.	f	a	n	GPFA 1986	USDA, NRCS 2006
late goldentrod	<i>Solidago gigantea</i>	Aiton	f	p	n	GPFA 1986	USDA, NRCS 2006
lemon scurfpea	<i>Psoraleidium lanceolatum</i>	(Pursh) Rydb.	f	p	n	GPFA 1986	USDA, NRCS 2006
Linum sp.	<i>Linum</i> sp.	L.	f	u	u	GPFA 1986	USDA, NRCS 2006
Louisiana sagewort	<i>Artemisia ludoviciana</i>	Nutt.	f	p	n	GPFA 1986	USDA, NRCS 2006
Missouri milkvetch	<i>Astragalus missouriensis</i>	Nutt.	f	p	n	GPFA 1986	USDA, NRCS 2006
narrowleaf fourclock	<i>Mirabilis linearis</i>	(Pursh) Heimerl	f	p	n	GPFA 1986	USDA, NRCS 2006
narrowleaf stoneseed	<i>Lithospermum incisum</i>	Lehm.	f	p	n	GPFA 1986	USDA, NRCS 2006
Nuttalls evolulus	<i>Evolvulus nuttalianus</i>	Roem. & Schult.	f	p	n	GPFA 1986	USDA, NRCS 2006
othake	<i>Palafoxia sphacelata</i>	(Torr.) Cory	f	a	n	GPFA 1986	USDA, NRCS 2006
Oxytropis sp.	<i>Oxytropis</i> sp.	DC.	f	p	u	GPFA 1986	USDA, NRCS 2006

Key: f=forb, g=graminoid, s=shrub, t=tree, a=annual, p=perennial, i=introduced, n=naive, u=unknown

## FORBS BY VERNACULAR NAME

Vernacular Name	Scientific Name	Authors	Type	Growth Habit	Nativity	Original Identification	Updated by
Packera sp.	<i>Packera</i> sp.	A.Löve & D.Löve	f	u	u	GPFA 1986	USDA, NRCS 2006
painted milkvetch	<i>Astragalus ceramicus</i> var. <i>filifolius</i>	Sheldon (A.Gray)F. J.Herm.	f	p	n	GPFA 1986	USDA, NRCS 2006
pale dock	<i>Rumex altissimus</i>	Alph. Wood	f	p	n	GPFA 1986	USDA, NRCS 2006
pale evening-primrose	<i>Oenothera albicaulis</i>	Pursh	f	a	n	GPFA 1986	USDA, NRCS 2006
palmleaf scurfpea	<i>Psoralea digitata</i>	Nutt. ex Torr. & A. Gray	f	p	n	GPFA 1986	USDA, NRCS 2006
penstemons	<i>Penstemon</i> spp.	Mitchell	f	p	n	GPFA 1986	USDA, NRCS 2006
pepperpod mustard	<i>Lepidium densiflorum</i>	Schrad.	f	a	n	GPFA 1986	USDA, NRCS 2006
plains fleabane	<i>Erigeron modestus</i>	Gray	f	p	n	GPFA 1986	USDA, NRCS 2006
Plains larkspur	<i>Delphinium virescens</i>	Nutt.	f	p	n	GPFA 1986	USDA, NRCS 2006
plains yellow primrose	<i>Calylophus serrulatus</i>	(Nutt.) Raven	f	p	n	GPFA 1986	USDA, NRCS 2006
poison milkweed	<i>Asclepia subverticillata</i>	(A. Gray) Vail	f	p	n	GPFA 1986	USDA, NRCS 2006
povertyweed	<i>Iva axillaris</i>	Pursh	f	p	n	GPFA 1986	USDA, NRCS 2006
prairie coneflower	<i>Ratibida columnifera</i>	(Nutt.) Woot. and Standl.	f	p	n	GPFA 1986	USDA, NRCS 2006
prairie groundcherry	<i>Physalis pumila</i>	Nutt.	f	p	n	GPFA 1986	USDA, NRCS 2006
prairie spidewort	<i>Tridascantia occidentalis</i>	(Britton) Smyth	f	p	n	GPFA 1986	USDA, NRCS 2006
prickly lettuce	<i>Lactuca serriola</i>	L.	f	a	i	GPFA 1986	USDA, NRCS 2006
prickly poppy	<i>Argemone polyanthemus</i>	(Fedde) G.B. Ownbey	f	p	n	GPFA 1986	USDA, NRCS 2006
prostrate vervain	<i>Verbena bracteata</i>	Cav. ex Lag. & Rodr.	f	p	n	GPFA 1986	USDA, NRCS 2006
purple ground cherry	<i>Quincula lobata</i>	(Torr.) Raf.	f	p	n	GPFA 1986	USDA, NRCS 2006
purple prairie clover	<i>Dalea purpurea</i>	Vent.	f	p	n	GPFA 1986	USDA, NRCS 2006
purselane	<i>Portulaca oleracea</i>	L.	f	a	i	GPFA 1986	USDA, NRCS 2006
redroot pigweed	<i>Amaranthus retroflexus</i>	L.	f	a	n	GPFA 1986	USDA, NRCS 2006
rush skeletonplant	<i>Lygodesmia juncea</i>	(Pursh) D. Don ex Hook.	f	p	n	GPFA 1986	USDA, NRCS 2006
Russian thistle	<i>Salsola iberica</i>	L.	f	a	i	GPFA 1986	USDA, NRCS 2006
salsify	<i>Tragopogon dubius</i>	Scop.	f	a	i	GPFA 1986	USDA, NRCS 2006
snowball sand verbena	<i>Abronia fragrans</i>	Nutt. ex Hook.	f	p	n	GPFA 1986	USDA, NRCS 2006
scarlet gaura	<i>Gaura coccinea</i>	Nutt. ex Pursh	f	p	n	GPFA 1986	USDA, NRCS 2006
scarlet globemallow	<i>Sphaeralcea coccinea</i>	Nutt.) Rydb.	f	p	n	GPFA 1986	USDA, NRCS 2006
short-ray prairie coneflower	<i>Ratibida tagetes</i>	(James) Barnh.	f	p	n	GPFA 1986	USDA, NRCS 2006
showy milkweed	<i>Asclepias speciosa</i>	Torr.	f	p	n	GPFA 1986	USDA, NRCS 2006
silky prairie clover	<i>Dalea villosa</i>	(Nutt.) Spreng.	f	p	n	GPFA 1986	USDA, NRCS 2006
silky sophora	<i>Sophora nuttalliana</i>	B.L. Turner	f	p	n	GPFA 1986	USDA, NRCS 2006
silverleaf scurfpea	<i>Psoralea argophylla</i>	Pursh.	f	p	n	GPFA 1986	USDA, NRCS 2006
slimflower scurfpea	<i>Psoralea tenuiflorum</i>	(Pursh) Rydb.	f	p	n	GPFA 1986	USDA, NRCS 2006
small lupine	<i>Lupinus pusillus</i>	Pursh	f	a	n	GPFA 1986	USDA, NRCS 2006

Key: f=forb, g=graminoid, s=shrub, t=tree, a=annual, p=perennial, i=introduced, n=naive, u=unknown

## FORBS BY VERNACULAR NAME

Vernacular Name	Scientific Name	Authors	Type	Growth Habit	Nativity	Original Identification	Updated by
snow on the mountain	<i>Euphorbia marginata</i>	Pursh	f	a	n	GPFA 1986	USDA, NRCS 2006
stiff flax	<i>Linum rigidum</i>	Pursh	f	p	n	GPFA 1986	USDA, NRCS 2006
stinking milkvetch	<i>Astragalus praelongus</i> var. <i>elisiae</i>	Sheldon (Rydb.) Barneby	f	p	n	GPFA 1986	USDA, NRCS 2006
streamside fleabane	<i>Erigeron glabellus</i> subsp. <i>pubescens</i>	Nutt. (Hook.) Cronq.	f	p	n	GPFA 1986	USDA, NRCS 2006
stickleaf mentzilia	<i>Mentzelia decapetala</i>	(Pursh ex Sims) Urban & Gilg ex Gilg	f	p	n	GPFA 1986	USDA, NRCS 2006
Texas croton	<i>Croton texensis</i>	(Klotzsch) Muell.-Arg.	f	a	n	GPFA 1986	USDA, NRCS 2006
thyme-leaved spurge	<i>Chamaesyce serpyllifolia</i> ssp. <i>serpyllifolia</i>	(Pers.) Small	f	a	n	GPFA 1986	USDA, NRCS 2006
timber milkvetch	<i>Astragalus miser</i>	Dougl.	f	p	n	GPFA 1986	USDA, NRCS 2006
narrowleaf poisonvetch	<i>Astragalus pectinatus</i>	(Dougl. ex Hook.) Dougl. ex G. Don	f	p	n	GPFA 1986	USDA, NRCS 2006
UF10	<i>Chenopodiaceae</i>		f	u	u	GPFA 1986	USDA, NRCS 2006
UF12	<i>Fabaceae</i>		f	u	u	GPFA 1986	USDA, NRCS 2006
UF20			f	u	u		
UF24			f	u	u		
UF25			f	u	u		
UF8	<i>Oxytropis</i> sp.	DC.	f	p	u	GPFA 1986	USDA, NRCS 2006
UF99	<i>Brassicaceae</i>		f	u	u	GPFA 1986	USDA, NRCS 2006
variable senecio	<i>Packera neomexicana</i> var. <i>mutabilis</i>	(Gray) W.A. Weber & A. Löve (Greene) W.A. Weber & A. Löve	f	p	n	GPFA 1986	USDA, NRCS 2006
velvet gaura	<i>Gaura parviflora</i>	Dougl. ex Lehm.	f	a	n	GPFA 1986	USDA, NRCS 2006
wallflower	<i>Erysimum asperum</i>	(Nutt.) DC.	f	p	n	GPFA 1986	USDA, NRCS 2006
wavyleaf thistle	<i>Cirsium undulatum</i>	(Nutt.) Spreng.	f	p	n	GPFA 1986	USDA, NRCS 2006
western fleabane	<i>Erigeron bellidiflorum</i>	Nutt.	f	a	n	GPFA 1986	USDA, NRCS 2006
western ragweed	<i>Ambrosia psilostachya</i>	DC.	f	p	n	GPFA 1986	USDA, NRCS 2006
white beardtongue	<i>Penstemon albidus</i>	Nutt.	f	p	n	GPFA 1986	USDA, NRCS 2006
silky crazyweed	<i>Oxytropis sericea</i>	Nutt.	f	p	n	GPFA 1986	USDA, NRCS 2006
white prairie clover	<i>Dalea candida</i>	Michx. ex Willd.	f	p	n	GPFA 1986	USDA, NRCS 2006
white sweetclover	<i>Meililotus alba</i>	Medik.	f	p	i	GPFA 1986	USDA, NRCS 2006
winecup	<i>Callitriche involucreta</i>	(Torr. & Gray) Gray	f	p	n	GPFA 1986	USDA, NRCS 2006
woolly locoweed	<i>Astragalus mollissimus</i>	Torr.	f	p	n	GPFA 1986	USDA, NRCS 2006
woolly indianwheat	<i>Plantago patagonica</i>	Jacq.	f	a	n	GPFA 1986	USDA, NRCS 2006
woolypod milkvetch	<i>Astragalus purshii</i>	Dougl. ex Hook.	f	p	n	GPFA 1986	USDA, NRCS 2006
yellow sweetclover	<i>Meililotus officinalis</i>	(L.) Lam.	f	p	i	GPFA 1986	USDA, NRCS 2006
yellow toadflax	<i>Linaria vulgaris</i>	P. Mill.	f	p	i	GPFA 1986	USDA, NRCS 2006



### **III - Graminoids by Scientific Name**

**Table 49: Graminoids by Scientific Name** - Graminoid species observed on the Sand Creek Massacre Site in 2005 & 2006. Species are listed by

Key: f=forb, g=graminoid, s=shrub, t=tree, a=annual, p=perennial, i=introduced, n=naive, u=unknown

Scientific Name		Vernacular Name		Authors		Type	Growth Habit	Nativity	Original Identification	Updated by
<b>GRAMINOIDS BY SCIENTIFIC NAME</b>										
<i>Achnatherum hymenoides</i>		Indian ricegrass		(Roemer & JA Shultes)	Barkworth	g	p	n	Hitchcock 1971	Barkworth 2004
<i>Agropyron cristatum</i>		crested wheatgrass		(L.) Gaerth.		g	p	i	Hitchcock 1971	Barkworth 2004
<i>Andropogon hallii</i>		sand bluestem		Hack.		g	p	n	Hitchcock 1971	Barkworth 2004
<i>Aristida oligantha</i>		prairie threeawn		Michx.		g	a	n	Hitchcock 1971	Barkworth 2004
<i>Aristida purpurea</i>		red threeawn		Nutt.		g	p	n	Hitchcock 1971	Barkworth 2004
<i>Bouteloua curtipendula</i>		sideoats grama		(Michx.) Torr.		g	p	n	Hitchcock 1971	Barkworth 2004
<i>Bouteloua gracilis</i>		blue grama		(Wild. ex Kunth) Lag. ex Griffiths		g	p	n	Hitchcock 1971	Barkworth 2004
<i>Bouteloua hirsuta</i>		hairy grama		Lag.		g	p	n	Hitchcock 1971	Barkworth 2004
<i>Buchloe dactyloides</i>		buffalograss		(Nutt.) Engelm.		g	p	n	Hitchcock 1971	Barkworth 2004
<i>Calamovilfa longifolia</i>		prairie sandreed		(Hook.) Scribn.		g	p	n	Hitchcock 1971	Barkworth 2004
<i>Carex filifolia</i>		threadleaf sedge		Nutt.		g	p	n	Johnston 2001	USDA, NRCS 2006
<i>Carex foenea</i>		silvertop sedge		Willd.		g	p	n	Johnston 2001	USDA, NRCS 2006
<i>Carex inops</i> ssp. <i>heliphila</i>		sun sedge		Bailey (Mackenzie) Crins		g	p	n	Johnston 2001	USDA, NRCS 2006
<i>Carex nebrascensis</i>		Nebraska sedge		Dewey		g	p	n	Johnston 2001	USDA, NRCS 2006
<i>Carex parryana</i>		Parry sedge		Dewey		g	p	n	Johnston 2001	USDA, NRCS 2006
<i>Carex praegracilis</i>		silver sedge		Boott		g	p	n	Johnston 2001	USDA, NRCS 2006
<i>Carex</i> sp.		sedge		L.		g	p	u	GPFA 1986	USDA, NRCS 2006
<i>Chloris verticillata</i>		windmill grass		Nutt.		g	p	n	Hitchcock 1971	Barkworth 2004
<i>Distichlis spicata</i>		inland saltgrass		(L.) Greene		g	p	n	Hitchcock 1971	Barkworth 2004
<i>Eleocharis</i> sp.		spike rush		R. Br.		g	p	u	GPFA 1986	USDA, NRCS 2006
<i>Elymus canadensis</i>		Canada wildrye		L.		g	p	n	Hitchcock 1971	Barkworth 2004
<i>Elymus elymoides</i>		bottlebrush squirreltail		(Raf.) Swezey		g	p	n	Hitchcock 1971	Barkworth 2004
<i>Elymus repens</i>		quackgrass		(L.) Gould		g	p	i	Hitchcock 1971	Barkworth 2004
<i>Elymus trachycaulus</i>		slender wheatgrass		(Link) Gould ex Shinners		g	p	n	Hitchcock 1971	Barkworth 2004
<i>Eragrostis trichodes</i>		sand lovegrass		(Nutt.) Wood		g	p	n	Hitchcock 1971	Barkworth 2004
<i>Hesperostipa comata</i>		needleandthread		(Trin. & Rupr.) Barkworth		g	p	n	Hitchcock 1971	Barkworth 2004
<i>Hilaria jamesii</i>		galleta		(Torr.) Benth.		g	p	n	Hitchcock 1971	Barkworth 2004
<i>Hordeum jubatum</i>		foxtail barley		L.		g	p	n	Hitchcock 1971	Barkworth 2004
<i>Hordeum pusillum</i>		little annual barley		Nutt.		g	a	n	Hitchcock 1971	Barkworth 2004
<i>Juncus balticus</i>		Baltic rush		Willd.		g	p	n	GPFA 1986	USDA, NRCS 2006
<i>Juncus effusus</i>		common rush		L.		g	p	n	GPFA 1986	USDA, NRCS 2006
<i>Juncus marginatus</i>		grassleaf rush		Rosk.		g	p	n	GPFA 1986	USDA, NRCS 2006

Key: f=forb, g=graminoid, s=shrub, t=tree, a=annual, p=perennial, i=introduced, n=naive, u=unknown

## GRAMINIODS BY SCIENTIFIC NAME

Scientific Name	Vernacular Name	Authors	Type	Growth Habit	Nativity	Original Identification	Updated by
<i>Achnatherum hymenoides</i>	Indian ricegrass	(Roemer & JA Shultes) Barkworth	g	p	n	Hitchcock 1971	Barkworth 2004
<i>Agropyron cristatum</i>	crested wheatgrass	(L.) Gaerth.	g	p	i	Hitchcock 1971	Barkworth 2004
<i>Andropogon hallii</i>	sand bluestem	Hack.	g	p	n	Hitchcock 1971	Barkworth 2004
<i>Aristida oligantha</i>	prairie threeawn	Mitchx.	g	a	n	Hitchcock 1971	Barkworth 2004
<i>Aristida purpurea</i>	red threeawn	Nutt.	g	p	n	Hitchcock 1971	Barkworth 2004
<i>Bouteloua curtipendula</i>	sideoats grama	(Michx.) Torr.	g	p	n	Hitchcock 1971	Barkworth 2004
<i>Bouteloua gracilis</i>	blue grama	(Willd. ex Kunth) Lag. ex Griffiths	g	p	n	Hitchcock 1971	Barkworth 2004
<i>Bouteloua hirsuta</i>	hairy grama	Lag.	g	p	n	Hitchcock 1971	Barkworth 2004
<i>Buchloe dactyloides</i>	buffalograss	(Nutt.) Engelm.	g	p	n	Hitchcock 1971	Barkworth 2004
<i>Calamovilfa longifolia</i>	prairie sandreed	(Hook.) Scribn.	g	p	n	Hitchcock 1971	Barkworth 2004
<i>Carex filifolia</i>	threadleaf sedge	Nutt.	g	p	n	Johnston 2001	USDA, NRCS 2006
<i>Carex foenea</i>	silvertop sedge	Willd.	g	p	n	Johnston 2001	USDA, NRCS 2006
<i>Carex inops ssp. heliophila</i>	sun sedge	Bailey (Mackenzie) Crins	g	p	n	Johnston 2001	USDA, NRCS 2006
<i>Carex nebrascensis</i>	Nebraska sedge	Dewey	g	p	n	Johnston 2001	USDA, NRCS 2006
<i>Carex parryana</i>	Parry sedge	Dewey	g	p	n	Johnston 2001	USDA, NRCS 2006
<i>Carex praegracilis</i>	silver sedge	Boott	g	p	n	Johnston 2001	USDA, NRCS 2006
<i>Carex sp.</i>	sedge	L.	g	p	u	GPFA 1986	USDA, NRCS 2006
<i>Chloris verticillata</i>	windmill grass	Nutt.	g	p	n	Hitchcock 1971	Barkworth 2004
<i>Distichlis spicata</i>	inland saltgrass	(L.) Greene	g	p	n	Hitchcock 1971	Barkworth 2004
<i>Eleocharis sp.</i>	spike rush	R. Br.	g	p	u	GPFA 1986	USDA, NRCS 2006
<i>Elymus canadensis</i>	Canada wildrye	L.	g	p	n	Hitchcock 1971	Barkworth 2004
<i>Elymus elymoides</i>	bottlebrush squirreltail	(Raf.) Swezey	g	p	n	Hitchcock 1971	Barkworth 2004
<i>Elymus repens</i>	quackgrass	(L.) Gould	g	p	i	Hitchcock 1971	Barkworth 2004
<i>Elymus trachycaulus</i>	slender wheatgrass	(Link) Coult ex Shimmers	g	p	n	Hitchcock 1971	Barkworth 2004
<i>Eragrostis trichodes</i>	sand lovegrass	(Nutt.) Wood	g	p	n	Hitchcock 1971	Barkworth 2004
<i>Hesperostipa comata</i>	needleandthread	(Trin. & Rupr.) Barkworth	g	p	n	Hitchcock 1971	Barkworth 2004
<i>Hilaria jamesii</i>	galleta	(Torr.) Benth.	g	p	n	Hitchcock 1971	Barkworth 2004
<i>Hordeum jubatum</i>	foxtail barley	L.	g	p	n	Hitchcock 1971	Barkworth 2004
<i>Hordeum pusillum</i>	little annual barley	Nutt.	g	a	n	Hitchcock 1971	Barkworth 2004
<i>Juncus balticus</i>	Baltic rush	Willd.	g	p	n	GPFA 1986	USDA, NRCS 2006
<i>Juncus effusus</i>	common rush	L.	g	p	n	GPFA 1986	USDA, NRCS 2006
<i>Juncus marginatus</i>	grassleaf rush	Rostk.	g	p	n	GPFA 1986	USDA, NRCS 2006



## **IV - Graminoids by Vernacular Name**

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Table 50: Graminoids by Vernacular Name - Graminoid species observed on the Sand Creek Massacre Site in 2005 & 2006. Species are listed by Vernacular Name

Vernacular Name	Scientific Name	Authors	Type	Growth Habit	Nativeity	Original Identification	Updated by
annual rabbitfoot grass	<i>Polygonum monspeliensis</i>	(L.) Desf.	g	a	i	Hitchcock 1971	Barkworth 2004
crested wheatgrass	<i>Agropyron cristatum</i>	(L.) Gaertn.	g	p	i	Hitchcock 1971	Barkworth 2004
quackgrass	<i>Elymus repens</i>	(L.) Gould	g	p	i	Hitchcock 1971	Barkworth 2004
alkali sacaton	<i>Sporobolus airoides</i>	(Torr.) Torr.	g	p	n	Hitchcock 1971	Barkworth 2004
Baltic rush	<i>Juncus balticus</i>	Willd.	g	p	n	GPFA 1986	USDA, NRCS 2006
blue grama	<i>Bouteloua gracilis</i>	(Willd. ex Kunth) Lag. ex Griffiths	g	p	n	Hitchcock 1971	Barkworth 2004
bottlebrush squirreiltail	<i>Elymus elymoides</i>	(Raf.) Swezey	g	p	n	Hitchcock 1971	Barkworth 2004
buffalograss	<i>Buchloe dactyloides</i>	(Nutt.) Engelm.	g	p	n	Hitchcock 1971	Barkworth 2004
Canada wildrye	<i>Elymus canadensis</i>	L.	g	p	n	Hitchcock 1971	Barkworth 2004
cattail	<i>Typha latifolia</i>	L.	g	p	n	GPFA 1986	USDA, NRCS 2006
chairmaker's bulrush	<i>Scirpus americanus</i>	(Pers.) Volk. ex Schinz & R. Keller	g	p	n	GPFA 1986	USDA, NRCS 2006
common rush	<i>Juncus effusus</i>	L.	g	p	n	GPFA 1986	USDA, NRCS 2006
cosmopolitan bulrush	<i>Scirpus maritimus var. paludosus</i>	(L.) Lye	g	p	n	GPFA 1986	USDA, NRCS 2006
foxtail barley	<i>Hordeum jubatum</i>	L.	g	p	n	Hitchcock 1971	Barkworth 2004
galleta	<i>Hilaria jamesii</i>	(Torr.) Benth.	g	p	n	Hitchcock 1971	Barkworth 2004
Glaucous bluegrass	<i>Poa glaucifolia</i>	Scribn. & Williams ex Williams	g	p	n	Hitchcock 1971	Barkworth 2004
grassleaf rush	<i>Juncus marginatus</i>	Rostk.	g	p	n	GPFA 1986	USDA, NRCS 2006
hairy grama	<i>Bouteloua hirsuta</i>	Lag.	g	p	n	Hitchcock 1971	Barkworth 2004
Indian ricegrass	<i>Achnatherum hymenoides</i>	(Roemer & JA Shultes) Barkworth	g	p	n	Hitchcock 1971	Barkworth 2004
inland saltgrass	<i>Distichlis spicata</i>	(L.) Greene	g	p	n	Hitchcock 1971	Barkworth 2004
little annual barley	<i>Hordeum pusillum</i>	Nutt.	g	a	n	Hitchcock 1971	Barkworth 2004
little bluestem	<i>Schizachyrium scoparium</i>	(Michx.) Nash	g	p	n	GPFA 1986	USDA, NRCS 2006
Nebraska sedge	<i>Carex nebrascensis</i>	Dewey	g	p	n	Johnston 2001	USDA, NRCS 2006
needleandthread	<i>Hesperostipa comata</i>	(Trin. & Rupr.) Barkworth	g	p	n	Hitchcock 1971	Barkworth 2004
Parry sedge	<i>Carex parryana</i>	Dewey	g	p	n	Johnston 2001	USDA, NRCS 2006
prairie cordgrass	<i>Spartina pectinata</i>	Link	g	p	n	Hitchcock 1971	Barkworth 2004
prairie junegrass	<i>Koeleria macrantha</i>	(Ledeb.) J.A. Schultes	g	p	n	Hitchcock 1971	Barkworth 2004
prairie sandreed	<i>Calamovilfa longifolia</i>	(Hook.) Scribn.	g	p	n	Hitchcock 1971	Barkworth 2004
prairie threeawn	<i>Aristida oligantha</i>	Michx.	g	a	n	Hitchcock 1971	Barkworth 2004
red threeawn	<i>Aristida purpurea</i>	Nutt.	g	p	n	Hitchcock 1971	Barkworth 2004
ring muhly	<i>Muhlenbergia torreyi</i>	(Kunth) A.S. Hitchc. ex Bush	g	p	n	Hitchcock 1971	Barkworth 2004
sand bluestem	<i>Andropogon hallii</i>	Hack.	g	p	n	Hitchcock 1971	Barkworth 2004

Key: f=forb, g=graminoid, s=shrub, t=tree, a=annual, p=perennial, i=introduced, n=native, u=unknown							
GRAMINIODS BY VERNACULAR NAME							
Vernacular Name	Scientific Name	Authors	Type	Growth Habit	Nativity	Original Identification	Updated by
sand dropseed	<i>Sporobolus cryptandrus</i>	(Torr.) Gray	g	p	n	Hitchcock 1971	Barkworth 2004
sand lovegrass	<i>Eragrostis trichodes</i>	(Nutt.) Wood	g	p	n	Hitchcock 1971	Barkworth 2004
sand paspalum	<i>Paspalum setaceum</i>	Michx.	g	p	n	Hitchcock 1971	Barkworth 2004
sandhill muhly	<i>Muhlenbergia pungens</i>	Thurb. Ex A. Gray	g	p	n	Hitchcock 1971	Barkworth 2004
scratchgrass	<i>Muhlenbergia asperifolia</i>	(Nees & Meyen ex Trin.) Parodi	g	p	n	Hitchcock 1971	Barkworth 2004
sideoats grama	<i>Bouteloua curtipendula</i>	(Michx.) Torr.	g	p	n	Hitchcock 1971	Barkworth 2004
silver sedge	<i>Carex praegracilis</i>	Boott	g	p	n	Johnston 2001	USDA, NRCS 2006
silvertop sedge	<i>Carex foenea</i>	Willd.	g	p	n	Johnston 2001	USDA, NRCS 2006
sixweeks fescue	<i>Vulpia octoflora</i>	(Walt.) Rydb.	g	a	n	Hitchcock 1971	Barkworth 2004
slender wheatgrass	<i>Elymus trachycaulus</i>	(Link) Gould ex Shinners	g	p	n	Hitchcock 1971	Barkworth 2004
sun sedge	<i>Carex inops ssp. heliophila</i>	Bailey (Mackenzie) Crins	g	p	n	Johnston 2001	USDA, NRCS 2006
switchgrass	<i>Panicum virgatum</i>	L.	g	p	n	Hitchcock 1971	Barkworth 2004
tall dropseed	<i>Sporobolus compositus</i>	(Poir.) Merr.	g	p	n	Hitchcock 1971	Barkworth 2004
threadleaf sedge	<i>Carex filifolia</i>	Nutt.	g	p	n	Johnston 2001	USDA, NRCS 2006
tumblegrass	<i>Schedonnardus paniculatus</i>	(Nutt.) Trei.	g	p	n	Hitchcock 1971	Barkworth 2004
vine mesquite	<i>Panicum obtusum</i>	Kunth	g	p	n	Hitchcock 1971	Barkworth 2004
western wheatgrass	<i>Pascopyrum smithii</i>	(Rydb.) A. Löve	g	p	n	Hitchcock 1971	Barkworth 2004
windmill grass	<i>Chloris verticillata</i>	Nutt.	g	p	n	Hitchcock 1971	Barkworth 2004
witchgrass	<i>Panicum capillare</i>	L.	g	a	n	Hitchcock 1971	Barkworth 2004
yellow indiagrass	<i>Sorghastrum nutans</i>	(L.) Nash	g	p	n	Hitchcock 1971	Barkworth 2004
Kentucky bluegrass	<i>Poa pratensis</i>	L.	g	p	ni	Hitchcock 1971	Barkworth 2004
Panicum sp.	<i>Panicum sp.</i>	L.	g	u	u	Hitchcock 1971	Barkworth 2004
sedge	<i>Carex sp.</i>	L.	g	p	u	GPFA 1986	USDA, NRCS 2006
spike rush	<i>Eleocharis sp.</i>	R. Br.	g	p	u	GPFA 1986	USDA, NRCS 2006
UG1			g	u	u		
UG2			g	u	u		



**V – Trees/Shrubs by Scientific  
Name**

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**Table 51: Shrubs/Trees by Scientific Name** - Shrub/tree species observed on the Sand Creek Massacre Site in 2005 & 2006. Species are listed by scientific

Key: f=forb, g=graminoid, s=shrub, t=tree, a=annual, p=perennial, i=introduced, n=native, u=unknown

Scientific Name	Vernacular Name	Authors	Growth			Original Identification	Updated by
			Type	Habit	Nativity		
<i>Artemisia filifolia</i>	sand sagebrush	Torr.	s	p	n	GPFA 1986	USDA, NRCS 2006
<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	(Hook.) Nutt.	s	p	n	GPFA 1986	USDA, NRCS 2006
<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i>	rubber rabbitbrush	(Pallas ex Pursh) Nesom & Baird	s	p	n	GPFA 1986	USDA, NRCS 2006
<i>Escobaria vivipara</i> var. <i>vivipara</i>	purple pincushion	(Nutt.) Buxbaum	s	p	n	GPFA 1986	USDA, NRCS 2006
<i>Gutierrezia sarothrae</i>	broom snakeweed	(Pursh) Britt. & Rusby	s	p	n	GPFA 1986	USDA, NRCS 2006
<i>Opuntia fragilis</i>	brittle cactus	(Nutt.) Haw.	s	p	n	GPFA 1986	USDA, NRCS 2006
<i>Opuntia polyacantha</i>	plains pricklypear	Haw.	s	p	n	GPFA 1986	USDA, NRCS 2006
<i>Populus deltoides</i>	eastern cottonwood	Bartr. ex Marsh.	t	p	n	GPFA 1986	USDA, NRCS 2006
<i>Rosa arkansana</i>	prairie rose	Porter	s	p	n	GPFA 1986	USDA, NRCS 2006
<i>Salix</i> sp.	willow	L.	s	p	u	GPFA 1986	USDA, NRCS 2006
<i>Toxicodendron rydbergii</i>	poison ivy	Small ex Rydb.) Greene	s	p	n	GPFA 1986	USDA, NRCS 2006
<i>Yucca glauca</i>	small soapweed	Nutt.	s	p	n	GPFA 1986	USDA, NRCS 2006

## **VI – Trees/Shrubs by Vernacular Name**

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**Table 52: Shrubs/Trees by Vernacular Name - Shrub/tree species observed on the Sand Creek Massacre Site in 2005 & 2006. Species are listed by**

**key: a=annual, p=perennial, s=shrub, t=tree, a=annual, p=perennial, i=introduced, n=ative, u=unknown**

Vernacular Name		Scientific Name	Authors	Type	Growth Habit	Nativity	Original Identification	Updated by
brittle cactus		<i>Opuntia fragilis</i>	(Nutt.) Haw.	s	p	n	GPFA 1986	USDA, NRCS 2006
broom snakeweed		<i>Gutierrezia sarothrae</i>	(Pursh) Britt. & Rusby	s	p	n	GPFA 1986	USDA, NRCS 2006
eastern cottonwood		<i>Populus deltoides</i>	Bartr. ex Marsh.	t	p	n	GPFA 1986	USDA, NRCS 2006
green rabbitbrush		<i>Chrysothamnus viscidiflorus</i>	(Hook.) Nutt.	s	p	n	GPFA 1986	USDA, NRCS 2006
plains pricklypear		<i>Opuntia polyacantha</i>	Haw.	s	p	n	GPFA 1986	USDA, NRCS 2006
poison ivy		<i>Toxicodendron rydbergii</i>	Small ex Rydb.) Greene	s	p	n	GPFA 1986	USDA, NRCS 2006
prairie rose		<i>Rosa arkansana</i>	Porter	s	p	n	GPFA 1986	USDA, NRCS 2006
purple pincushion		<i>Escobaria vivipara</i> var. <i>vivipara</i>	(Nutt.) Buxbaum	s	p	n	GPFA 1986	USDA, NRCS 2006
rubber rabbitbrush		<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i>	(Pallas ex Pursh) Nesom & Baird	s	p	n	GPFA 1986	USDA, NRCS 2006
sand sagebrush		<i>Artemisia filifolia</i>	Torr.	s	p	n	GPFA 1986	USDA, NRCS 2006
willow		<i>Salix</i> sp.	L.	s	p	u	GPFA 1986	USDA, NRCS 2006
small soapweed		<i>Yucca glauca</i>	Nutt.	s	p	n	GPFA 1986	USDA, NRCS 2006

## Appendix E: Soil Classification Table

Table 53: Kiowa County Soil Classification - Classification of the soils of Kiowa County, CO (USDA, SCS 1981).

Soil name	Family or higher taxonomic class
Absted-----	Fine, montmorillonitic, mesic Haplustollic Natrargids
Arvada-----	Fine, montmorillonitic, mesic Ustollic Natrargids
Baeg-----	Fine, montmorillonitic, mesic Ustollic Haplargids
Bankard-----	Sandy, mixed, mesic Ustic Torrifuvents
Bijou-----	Coarse-loamy, mixed, mesic Ustollic Haplargids
Cadoma-----	Fine, montmorillonitic, mesic Ustollic Camborthids
Canyon-----	Loamy, mixed (calcareous), mesic, shallow Ustic Torriorthents
Colby-----	Fine-silty, mixed (calcareous), mesic Ustic Torriorthents
Fort Collins-----	Fine-loamy, mixed, mesic Ustollic Haplargids
Glenberg-----	Coarse-loamy, mixed (calcareous), mesic Ustic Torrifuvents
Goshen-----	Fine-silty, mixed, mesic Pachic Argiustolls
Harvey-----	Fine-loamy, mixed, mesic Ustollic Calcioorthids
Haverson-----	Fine-loamy, mixed (calcareous), mesic Ustic Torrifuvents
Keyner-----	Fine-loamy, mixed, mesic Haplustollic Natrargids
Keyner Variant-----	Fine-loamy, mixed, mesic Haplustollic Natrargids
Kim-----	Fine-loamy, mixed (calcareous), mesic Ustic Torriorthents
Larimer-----	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Ustollic Haplargids
Limon-----	Fine, montmorillonitic (calcareous), mesic Ustertic Torriorthents
Manzanola-----	Fine, montmorillonitic, mesic Ustollic Haplargids
Midway-----	Clayey, montmorillonitic (calcareous), mesic, shallow Ustic Torriorthents
Norka-----	Fine-silty, mixed, mesic Aridic Argiustolls
Olney-----	Fine-loamy, mixed, mesic Ustollic Haplargids
Otero-----	Coarse-loamy, mixed (calcareous), mesic Ustic Torriorthents
Pultney-----	Fine-loamy, mixed, mesic Ustollic Calcioorthids
Richfield-----	Fine, montmorillonitic, mesic Aridic Argiustolls
Shingle-----	Loamy, mixed (calcareous), mesic, shallow Ustic Torriorthents
Singerton-----	Fine-loamy, carbonatic, mesic Ustollic Calcioorthids
Stoneham-----	Fine-loamy, mixed, mesic Ustollic Haplargids
Sundance-----	Fine-loamy, mixed, mesic Ustollic Haplargids
Valent-----	Mixed, mesic Ustic Torrripsamments
Vona-----	Coarse-loamy, mixed, mesic Ustollic Haplargids
Wiley-----	Fine-silty, mixed, mesic Ustollic Haplargids



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