Ecological site R051XA001NM
Loamy

Last updated: 9/07/2023
Accessed: 10/12/2024

General information

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

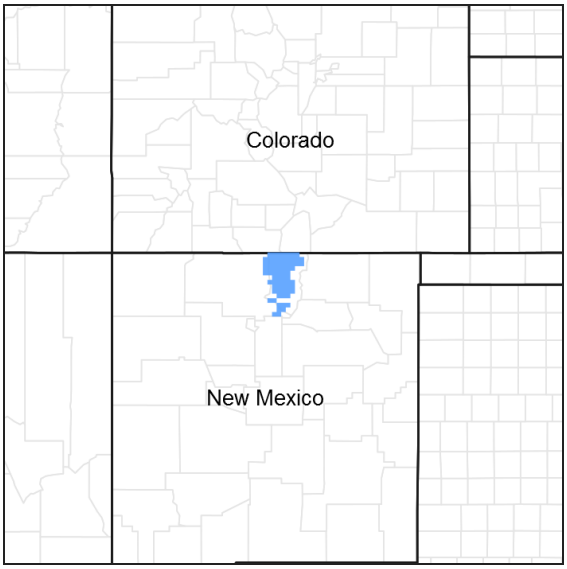


Figure 1. Mapped extent

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

MLRA notes

Major Land Resource Area (MLRA): 051X–High Intermountain Valleys

This MLRA encompasses the San Luis Valley in south central Colorado and the Taos Plateau and Taos alluvial piedmonts of north central New Mexico. As part of the northern portion of the Rio Grande Rift, the MLRA consists of large, alluvium filled basins washed down from adjacent mountain ranges. The Rio Grande River flows through this MLRA, continuing its long function of carrying mountain sediment down to the basin. Cenozoic volcanism is an extensive characteristic of the MLRA where large basalt flows with volcanic hills and domes are abundant.

Classification relationships

NRCS:
Major Land Resource Area 51, High Intermountain Valleys (United States Department of Agriculture, Natural Resources Conservation Service, 2006).

USFS:
331J – Northern Rio Grande Basin M331Ic > 331Ja - San Luis Valley, 331Jb - San Luis Hills and 331C - Mogotes

EPA:
22 - Arizona/New Mexico Plateau > 22a - San Luis Shrublands and Hills ; 22b -San Luis Alluvial Flats and Wetlands

; 22c - Salt Flats; 22e - Sand Dunes and Sand Sheets and 22f -Taos Plateau (Griffith, 2006).

USGS:
Southern Rocky Mountain Province

Ecological site concept

The Loamy site occurs primarily on the slope between the Sangre de Cristo Mountains and the Taos Plateau. The major landform where alluvial fans and valley sides have been dissected by minor drainages. Slopes vary from 0 to 5 percent. Soils are deep, and well drained The taxonomic particle size is fine-loamy or fine loamy over sandy or over sandy-skeletal. The surface texture is loam or clay loam. If the skeletal substrata is present, depth to it ranges from 12 to 20 inches. An argillic (accumulated clay) diagnostic horizon is present.

Associated sites

R036XA004NM	**Gravelly Slopes** Gravelly Slopes - Slopes are 3-25%; Soils are skeletal and deep. Soil surface textures are gravelly to very gravelly loam or cobbly loam with subsoil that are loams to clay loam. Landforms are rolling hills, divides, and ridges.
R036XB018NM	**Stony Loam** Stony Loam - Slopes 0-15%; soils are deep to very deep and skeletal and non-skeletal; Surface soil textures are cobbly loam, or loam. Subsoils are loamy. Landforms are nearly level alluvial fans, stream terraces, plateaus, mesas and volcanic cones.
R036XB006NM	**Loamy** Loamy - Slopes are 1-15%; Soils are moderately deep to deep; soil surface range from loam, gravelly loam, loamy fine sand, fine sandy loam, sandy loam, silt loam and clay loam. Subsoil is loamy and range from loam to clay loam. Landforms are mesas, plateaus, fan remnant, terraces, dipslopes on cuestas, and broad upland valley sides.
R051XA006NM	**Breaks** The Breaks site exists on steep colluvial slopes of the Rio Grande Canyon versus the Piedmont fans of the Loamy site.
R051XY317CO	**Foothill Loam** The Foothill Loam Site is primarily a grassland community without the higher mix of big sagebrush and located a little higher up on the mountain front alluvial fans.

Similar sites

R051XY278CO	**Valley Bench 8-12 PZ** The Valley Bench site is very similar and could possibly be combined with the New Mexico Loamy site. The New Mexico Loamy site tends to express itself with a few extra warm season species. The Valley Bench site seems to have a wider range of surface texture and particle size class Further study regarding combining these two sites is recommended.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata*
Herbaceous	(1) *Pascopyrum smithii*

Physiographic features

The Loamy site occurs primarily on the slope between the Sangre de Cristo Mountains and the Taos Plateau. The major landform where alluvial fans and valley sides have been dissected by minor drainages. Slopes vary from 0 to 5 percent.

Table 2. Representative physiographic features

Landforms	(1) Valley side (2) Alluvial fan
Runoff class	Low to medium
Flooding frequency	None
Ponding frequency	None
Elevation	6,500–8,000 ft
Slope	0–5%
Aspect	Aspect is not a significant factor

Climatic features

Mean annual precipitation varies from 9 to 13 inches. Departures from the average of 4 inches or more are common. Approximately 50 percent of this moisture occurs during the vegetative growth period, April through September. Over 20 percent of the precipitation comes in the form of high intensity summer thunderstorms which influence the presence and production of warm-season plants. Winter and early spring moisture in the form of rain or snow influences the presence and production of cool-season plants. This moisture also influences maximum shrub growth.

Mean annual temperature varies from 64 degrees F in July to 21 degrees F in January. The average last killing frost in the spring is May 30 and the first killing frost in the fall is September 30. The frost-free period is approximately 120 days, but freezing temperatures have been recorded every month except July and August.

Wind velocities are relatively light most of the year with stronger winds occurring in the spring and early summer. These winds increase transpiration rates of plants and rapidly dry the surface soil.

Table 3. Representative climatic features

Frost-free period (characteristic range)	84-88 days
Freeze-free period (characteristic range)	99 days
Precipitation total (characteristic range)	9-13 in
Frost-free period (actual range)	83-89 days
Freeze-free period (actual range)	99 days
Precipitation total (actual range)	9-13 in
Frost-free period (average)	86 days
Freeze-free period (average)	99 days
Precipitation total (average)	11 in

Climate stations used

- (1) CERRO [USC00291630], Questa, NM
- (2) MANASSA [USC00055322], La Jara, CO

Influencing water features

This site is not influenced by water from a wetland or stream.

Soil features

Soils are deep, and well drained The taxonomic particle size is fine-loamy or fine loamy over sandy or over sandy-skeletal. The soil formed in stratified gravelly, cobbly and sandy alluvium. The surface texture is loam or clay loam. If the skeletal substrata is present, depth to it ranges from 12 to 20 inches. An argillic diagnostic horizon is present.

Table 4. Representative soil features

Parent material	(1) Slope alluvium–igneous and metamorphic rock
Surface texture	(1) Loam (2) Clay loam
Family particle size	(1) Fine-loamy (2) Fine-loamy over sandy or sandy-skeletal
Drainage class	Well drained
Permeability class	Moderately slow to moderate
Soil depth	60–120 in
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0–1%
Available water capacity (Depth not specified)	3–7 in
Calcium carbonate equivalent (Depth not specified)	0–5%
Electrical conductivity (Depth not specified)	0–2 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0–2
Soil reaction (1:1 water) (Depth not specified)	6.6–7.8
Subsurface fragment volume <=3" (Depth not specified)	5–55%
Subsurface fragment volume >3" (Depth not specified)	0–5%

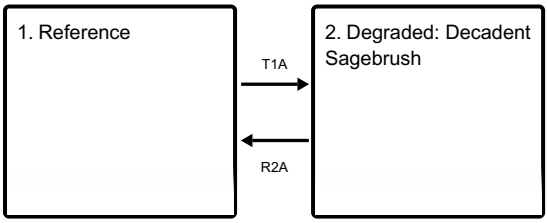
Ecological dynamics

This is mainly a grassland site, with big sagebrush and other shrubs making up about 20% of the annual yield. Western wheatgrass, is the dominant grass species, while big sagebrush is the dominant shrub. Other species include blue grama, sideoats grama, squirreltail, and fourwing saltbush.

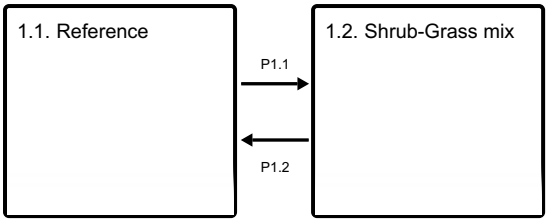
Much of this site has been highly disturbed and presents itself with an extensive canopy of Wyoming big sagebrush. As one transects closer to the mountain base, pinyon and juniper may be scattered. In places where grass species are allowed to grow with limited defoliation, they may begin to out-compete the shrubs, especially if they increase fuel loads and aid in greater frequency of fire.

State and transition model

Ecosystem states



State 1 submodel, plant communities



State 1
Reference

The reference state has a mix of grasses, forbs, and shrubs. Grasses provide the most annual production with shrubs secondary. The state has a diversity of cool and warm season species such as western wheatgrass, blue grama, sideoats grama, and squirreltail, with Wyoming big sagebrush scattered throughout.

Resilience management. The reference state is the most resilient to disturbance. A mix of grass and shrubs provides a diversity of root systems which maximizes ecological processes such as decomposition, mineralization, and soil aggregation. This in turn provides for greatest water infiltration and protection from erosion.

Community 1.1
Reference

The potential vegetation is about 70% grasses and grass-like plants, 5% forbs, and 25% shrubs. The plant community is dominated by both cool and warm-season grasses, shrubs, and a scattering of forbs. The dominant grasses are western wheatgrass and blue grama. Sub-dominant grasses include sideoats grama, bottlebrush squirreltail, sand dropseed, and threeawn. Significant forbs include scarlet globemallow, buckwheat species, primrose, penstemon, aster, lupine, and groundsel species. Big sagebrush is the dominant shrub, making up 15-25% of the total vegetative production. Other shrubs include rubber rabbitbrush and fourwing saltbush.

Resilience management. This plant community is well adapted to the San Luis Valley climatic conditions and is resilient to many disturbances. 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 low. This is a sustainable plant community in terms of soil stability, watershed function and biologic integrity.

Dominant plant species

- Wyoming big sagebrush (*Artemisia tridentata ssp. wyomingensis*), shrub
- western wheatgrass (*Pascopyrum smithii*), grass

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	225	450	600
Shrub/Vine	80	150	230
Forb	30	50	80
Tree	0	10	40
Total	**335**	**660**	**950**

Figure 9. Plant community growth curve (percent production by month). NM3501, R051XA001NM Loamy HCPC. R051XA001NM Loamy HCPC Western wheatgrass grassland with scattered shrubs. Other grasses, shrubs, and forbs are minor components..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	5	10	10	25	30	12	5	0	0

Community 1.2
Shrub-Grass mix

Big sagebrush, rubber rabbitbrush, and snakeweed have significantly increased. Western wheatgrass, sideoats grama and fourwing saltbush have decreased in density, production, and vigor. Grass species with grazing defenses such as blue grama, sand dropseed, threeawn, galleta, and ring muhly have increased.

Resilience management. Herbaceous plant frequency, vigor, and litter have decreased. Increased bare ground between shrubs is beginning to occur. Water cycle, nutrient cycle, and biotic integrity of the community are becoming impaired. This is an "at-risk" community in danger of crossing a threshold to a decadent sagebrush state.

Pathway P1.1
Community 1.1 to 1.2

Over time, without fire to keep shrubs in check, coupled with grazing that continuously pressures palatable species such as western wheatgrass with moderate to high utilization, the site becomes shrub dominant. Shrubs have a competitive advantage with natural grazing defenses and deep tap roots that can secure water and nutrients.

Pathway P1.2
Community 1.2 to 1.1

Grazing management where grass cover improves over time may build enough fine fuel to carry fire and move the site back to a natural fire regime. The natural fire regime will help keep the shrubs in check and allow for grasses to re-establish. Overtime with a more natural fire regime (10-20 years), grasses will show greater annual production than shrubs. .

State 2
Degraded: Decadent Sagebrush

Big sagebrush dominates the plant community. Western wheatgrass and blue grama remain scattered and in low vigor. If blue grama is present, it frequently appears low in stature in shallow rooted patches. As the site continues to lose herbaceous species due to multiple feedbacks, bare ground increases and a surface soil crust develops. This soil surface condition retards water infiltration and grass establishment/recruitment and allows the site to persist in a big sagebrush state. Production, species composition, and diversity are drastically reduced. Water cycle, nutrient cycle, and biotic integrity have been severely affected. As litter amounts decrease, bare areas increase. The semiarid environment coupled with loss of cover, magnifies soil surface crusting which impairs infiltration subsequently increasing overland flow. In advanced stages of non-activity, big sagebrush will show signs of decadence and mortality.

Resilience management. This state has limited resilience to disturbance. Erosion is active with new gullies evident. Long-duration drought may affect and kill the sagebrush as well.

Transition T1A
State 1 to 2

The major long-term driver is repetitive, high utilization grazing of grass species while not allowing for regrowth and recovery for multiple years. This type of management eventually decreases health and vigor of grasses, fine fuel and the site's ability to carry fire. Big sagebrush gains a competitive advantage due to deep root systems and natural grazing defenses. Eventually the bare soil forms a crust due to low aggregate stability and a high percentage of bare ground. This makes it difficult for recruits to germinate.

Restoration pathway R2A
State 2 to 1

Short-term sagebrush treatment, coupled with range seeding, and a period of grazing rest for stand establishment. Shrub removal should not be wholesale but in a mosaic of patchiness as sagebrush is an important species for the health of the site. It is also best to implement long-term grazing management strategies where indicator plant

species are seldom defoliated during the critical growth period and have an opportunity to colonize and restore ecosystem health.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1				275–344	
	western wheatgrass	PASM	*Pascopyrum smithii*	275–344	–
2				1–34	
	sideoats grama	BOCU	*Bouteloua curtipendula*	1–34	–
3				14–24	
	squirreltail	ELEL5	*Elymus elymoides*	14–24	–
4				14–28	
	blue grama	BOGR2	*Bouteloua gracilis*	14–28	–
5				1–34	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	1–34	–
Forb					
6				7–14	
	aster	ASTER	*Aster*	7–14	–
7				1–21	
	buckwheat	ERIOG	*Eriogonum*	1–21	–
8				1–21	
	milkvetch	ASTRA	*Astragalus*	1–21	–
9				1–21	
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	1–21	–
10				1–21	
	woolly plantain	PLPA2	*Plantago patagonica*	1–21	–
11				1–21	
	Forb, perennial	2FP	*Forb, perennial*	1–21	–
12				1–21	
	Forb, annual	2FA	*Forb, annual*	1–21	–
Shrub/Vine					
13				103–138	
	big sagebrush	ARTR2	*Artemisia tridentata*	103–138	–
14				1–21	
	fourwing saltbush	ATCA2	*Atriplex canescens*	1–21	–
15				7–14	
	pingue rubberweed	HYRI	*Hymenoxys richardsonii*	7–14	–
16				7–14	
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	7–14	–
17				1–7	
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var.*	1–7	–

			nauseosa		
18				1–28	
	Shrub, deciduous	2SD	*Shrub, deciduous*	1–28	–
Tree					
19				1–10	
	twoneedle pinyon	PIED	*Pinus edulis*	0–5	–
	oneseed juniper	JUMO	*Juniperus monosperma*	0–5	–

Animal community

Grazing:

Approximately 90 percent of the vegetation produced on this site is suitable for grazing or browsing by domestic livestock and wildlife. Grazing distribution is generally not a problem if adequate waterings are provided. Continuous grazing, which allows repetitive grazing of the desirable species, eventually leads to a decrease in these species from the plant community. Such deterioration is indicated by a decrease in western wheatgrass, sideoats grama, and four-wing saltbush. Species that increase include blue grama, dropseeds, threeawns, big sagebrush, rabbitbrush, and broom snakeweed. A planned grazing system with periodic deferment is best to maintain the desirable balance between plant species and to maintain high productivity.

Habitat for Wildlife:

This ecological site provides habitat which supports a resident animal community that is characterized by pronghorn antelope, long-tailed weasel, white-tailed jackrabbit, Ord’s kangaroo rat, Gunnison’s prairie dog, Botta pocket gopher, horned lark, and western toad.

The vesper sparrow is a typical summer resident. Mule deer and elk will move out of adjacent habitats to feed on this site. Antelope were absent from the historical ranges from approximately 1910 until the early 1940’s, when wild captured animals were transplanted to the long unoccupied habitats.

Hydrological functions

The runoff curve numbers are determined by field investigations using hydrologic cover conditions and hydrologic soil groups.

Hydrologic Interpretations
Soil Series -----Hydrologic Group
Manzano---------- B
Stunner---------- B
Tenorio---------- B

Recreational uses

This site has little recreation value and fair value for picnicking, camping, or hunting. It has poor value for aesthetic appeal and natural beauty. In the spring and early summer, blooming forbs provide a fair aesthetic appeal.

Wood products

This site produces no significant wood products in the potential plant community.

Other information

Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month

Similarity Index---- Ac/AUM
100 - 76---------- 2.9 – 3.9

75 – 51---------- 3.8 – 5.9
50 – 26---------- 5.7 – 11.8
25 – 0---------- 11.8+

Inventory data references

Field Offices in Colorado where the site occurs:
Chama, NM

Type locality

Location 1: Taos County, NM

References

. 2021 (Date accessed). USDA PLANTS Database. http://plants.usda.gov.

Other references

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Cleland, D.T.; Freeouf, J.A.; Keys, J.E.; Nowacki, G.J.; Carpenter, C.A.; and McNab, W.H. 2007. Ecological Subregions: Sections andSubsections for the conterminous United States. Gen. Tech. Report WO-76D [Map on CD-ROM] (A.M. Sloan, cartographer). Washington,DC: U.S. Department of Agriculture, Forest Service, presentation scale 1:3,500,000; colored.

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296.

Contributors

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Approval

Kirt Walstad, 9/07/2023

Acknowledgments

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--Site Development and Testing Plan--:
Future work to validate and further refine the information in this Provisional Ecological Site Description is necessary. This will include field activities to collect low-, medium-, and high-intensity sampling, soil correlations, and analysis of that data.

Additional information and data are required to refine the Plant Production and Annual Production tables for this ecological site. The extent of MLRA 51 must be further investigated.

Field testing of the information contained in this Provisional ESD is required. As this ESD is moved to the Approved ESD level, reviews from the technical team, quality control, quality assurance, and peers will be conducted.

Rangeland health reference sheet

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

Author(s)/participant(s)	Scott Woodall
Contact for lead author	
Date	06/26/2012
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None to very rare. Some minor rilling may be found on slopes greater than five percent after fire and a severe storm event. Rills are widely spaced and short.

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2. **Presence of water flow patterns:** None to very rare. Following intense rainfall events, there may be a few and short (3-6 feet) water flow patterns which are not connected. On slopes greater than five percent, following fire and rain, flow patterns may extend up to 10 feet, but still be widely spaced.

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3. **Number and height of erosional pedestals or terracettes:** Very minor. Plant or rock pedestals and terracettes are almost always in water flow patterns. Some build up of soil occurs under sagebrush due to settling of wind-blown material.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 20% or less bare ground, with bare patches ranging from 6-10 inches in diameter. Prolonged drought or wildfire events will cause bare ground to increase upwards to 20-30% with bare patches ranging from 10-12 inches in diameter.

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5. **Number of gullies and erosion associated with gullies:** No gullies are actively eroding. Some stable gullies may be present in landscape settings where off-site drainage exists, caused by natural events such as fire followed by an intensive rainfall event. Gullies are shallow with blunted edges and are re-stabilizing.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Wind erosion is very minor on this site, occasionally showing deposition under shrub canopy. Minor erosion can occur following periods of severe wildfires and extended drought.

7. **Amount of litter movement (describe size and distance expected to travel):** Most litter is leaves and small stems. Movement will mostly occur in flow patterns for distances of 1-3 feet following intense rainfall events and depositing where the slope flattens out. Woody litter (if present) should not move from beneath or adjacent to the plant.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** This site should have a soil stability rating of 4-5 in the interspaces and 5-6 underneath plants.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** The dominant series is the Tenorio, which consists of deep, well drained soils that formed in stratified gravelly, cobbly and sandy alluvium. The typical pedon contains an A horizon (0-3 inches), followed by a B1 (3-9 inches), and a B2t (9-14 inches.) The texture of the A and B1is fine loamy, while the B2t is a clay loam. The A1 is dark yellowish brown (7.5YR 3/2) moist, with weak, fine granular structure. The B1 is reddish brown (5YR 4/3) moist, with weak fine subangular blocky structure parting to weak fine granular. These soils have a high water holding capacity along with moderate permeability.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** The composition/distribution of cool rhizomatous grasses, bunchgrasses and scattered shrubs tend to slow overland flow and reduce raindrop impact while improving infiltration. Due to the nature of loam to clay loam soils all structural components are needed to promote infiltration and reduce runoff.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** There should be no compaction layer on this site. Due to the loamy texture of this soil and the presence of an argillic horizon, this soil could compact easily with disturbance, such as vehicle traffic, recreation, or plowing.

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

    Dominant: Dominant: Cool Season rhizomatous grass (Western wheat) >

    Sub-dominant: Sub-dominant: cool season bungrasses > shrubs=warm season grasses >>

    Other: Others: forbs (annual and perennial)>trees (pinon).

    Additional: In the natural range of variability, sagebrush increases over time until fire moves through the system, knocking back the sagebrush and invigorating the western wheat. Extreme herbivory in the spring and early summer, coupled with winter drought will also decrease the cool season component. Occasionally trees (pinyon) will invade on this site if fire frequency has been greatly diminished.

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** During years with average to above-average precipitation, there should be very little recent mortality or decadence apparent in either the grasses or shrubs. Some mortality of cool season grasses may occur during severe winter droughts. Repeated herbivory during the critical growing period for western wheat (May and June) will increase mortality for the cool season rhizomatous component. Shrub mortality would be limited to severe, multiple year droughts. Very little decadence occurs on this site.

14. **Average percent litter cover (%) and depth (in):** Liter cover ranges from 30-40%. Litter cover during and following drought can range from 15-20%, and 5-15% following wildfire. Litter depth is higher under shrubs.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Long term average is 335 lbs/ac; 660 lbs during unfavorable conditions; 950 lbs for favorable conditions. Severe, extended drought can reduce production to an very low level of 200-400 lbs/ac.

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Tree species such as pinon and juniper can invade this site causing decreased hydrologic function. At times shrubs such as sagebrush and rubber rabbitbrush can dominate due to various forms of disturbance or lack of disturbance.

17. **Perennial plant reproductive capability:** During years with average to above average growing conditions, all perennial plants should have the ability in most years to produce see, tillers, or sprouts. Natural events that cause limitations to plant reproductive capability include: wildfire, drought, natural disease, inter-species competition, insect cycles, and wildlife activity.