Ecological site R036XY408CO
Basin Shale

Accessed: 04/24/2024

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.

MLRA notes

Major Land Resource Area (MLRA): 036X–Southwestern Plateaus, Mesas, and Foothills

Basin Shale ecological site is found on hills and ridges in MLRA 36 (Southwestern Plateaus Mesas and Foothills). The MLRA 36 is illustrated orange color on the map. The ecological site locations as assigned in soil survey map units are shown in pink color.

The site concept was established within the MLRA 36 semi-desert regions. This zone is 9 to 12 inches of precipitation and has a mesic temperature regime. This site has bimodal precipitation that is dominated by black sagebrush.

Classification relationships

NRCS & BLM:
Major Land Resource Area 36, Southwestern Plateaus Mesas and Foothills (United States Department of Agriculture, Natural Resources Conservation Service, 2006).

USFS:
341Bd-Salt Anticline Benchlands, and 341Bq-South Uncompahgre Plateau Subsections <341B Northern Canyonlands Section < 341 Intermountain Semi-desert and Desert (Cleland, et al., 2007).

313Bc Chuska Valley Cold Desert Shrubland Subsection <313B Navaho Canyonlands Section < 313 Colorado Plateau Semi-Desert (Cleland, et al., 2007).

313Ac-Monument Upwarp subsections <313A Grand Canyons Section < 313 Colorado Plateau Semi-Desert (Cleland, et al., 2007).

EPA:
20b Shale Deserts and Sedimentary Basins and 20c Semiarid Benchlands and Canyonlands, < 20 Colorado Plateau < 10.l Cold Deserts < 10 North American Deserts (Griffith, 2006).

USGS:
Colorado Plateau Province (Canyonlands Section)

Ecological site concept

The 36X Basin Shale was drafted from the existing Basin Shale Range Site 35(SCS, January, 1981). This site was written prior to MLRA 36 being mapped in Colorado and this area was in MLRA 35X when it was written. This site occurs on low alluvial terraces, ridges and hills on moderately deep to deep soils. Soil textures are silty clay loam and clay loams. It is a black sagebrush – western wheatgrass community. It has an ustic aridic moisture regime and mesic temperature regime. The effective precipitation ranges from 9 to 12 inches.

Similar sites

R048AA235CO	**Dry Exposure Gunnison Basin LRU** Dry Exposure is a very shallow to shallow soil that is found on ridges and hills. This site is frigid. Dominant plants are black sagebrush, Indian ricegrass, and muttongrass.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia nova* (2) *Ceratoides lanata*
Herbaceous	(1) *Pleuraphis jamesii* (2) *Pascopyrum smithii*

Physiographic features

This site occurs on low alluvial terraces, ridges, hills, structural benches, and alluvial fans. Slopes range from 1 to 20 percent. Elevations range 5400 to 6800 feet.

Under proper management, these soils have a surface runoff of medium to very high. However, if the vegetation is depleted, erosion can be very high.

Table 2. Representative physiographic features

Landforms	(1) Ridge (2) Hill (3) Structural bench
Flooding frequency	None
Ponding frequency	None
Elevation	5,400–6,800 ft
Slope	1–20%
Aspect	Aspect is not a significant factor

Climatic features

Average annual precipitation is about 9 to 12 inches. This area is located where there is winter precipitation and summer monsoonal rains meet. Of this, 45-50% falls as snow, and 50-55% falls as rain. Snow usually falls from November to March. Rains are falls April 1 thru October 31. The driest period is usually May to June. Plant growth begins late March and early April. Cool-season plants start a dormancy period during June. Summer thundershowers are common in July to September. The summer moisture will favor growth from the warm season plants. When late summer and fall rains occur, warm-season plants accelerate growth, and some regrowth occurs on cool-season species. Shrub species continue growth through the entire growing season. The average annual total snowfall is 17.8 inches. The highest winter snowfall record in this area is 44.8 inches which occurred in 1972-1973. The lowest snowfall record is zero inches during the 1999-2000 winter. The highest yearly precipitation recorded was 19.02 in 2015 and the lowest was 5.17 in 1989. Mean daily annual air temperature is about 50ºF to 54ºF, averaging about 33ºF for the winter and 61ºF through the growing season, March through October. Summer temperatures of 100ºF or more are not unusual. The frost-free period typically ranges from 125 to 165 days at Hovenweep NM (national monument). The last spring frost is the first part of May to the end of May. The first fall frost is the end of September to the middle of October. Mean annual temperature ranges from 55 to 49ºF. Average annual temperature is 51.9ºF. The coldest winter temperature recorded was -24ºF on December 24, 1990 and the coldest summer temperature recorded was 26ºF on June 12, 1970. The hottest day on record is 106 ºF on July 15, 1998. Wide yearly and seasonal fluctuations are common for this climatic zone. Data taken from Western Regional Climate Center (2017) for Hovenweep NM, Utah Climate Station. Hovenweep NM is on the Western edge of the MLRA. Hovenweep NM is the only station occurring in the MLRA in this zone. It is on the upper end of precipitation. There is a need for climate date in the zone.

Table 3. Representative climatic features

Frost-free period (average)	131 days
Freeze-free period (average)	146 days
Precipitation total (average)	12 in

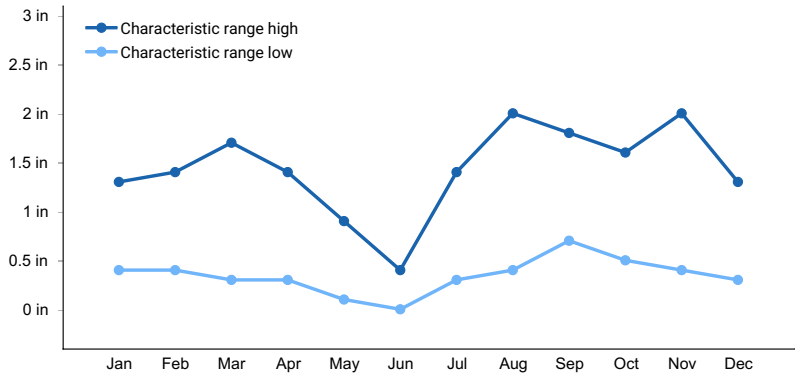

Figure 1. Monthly precipitation range

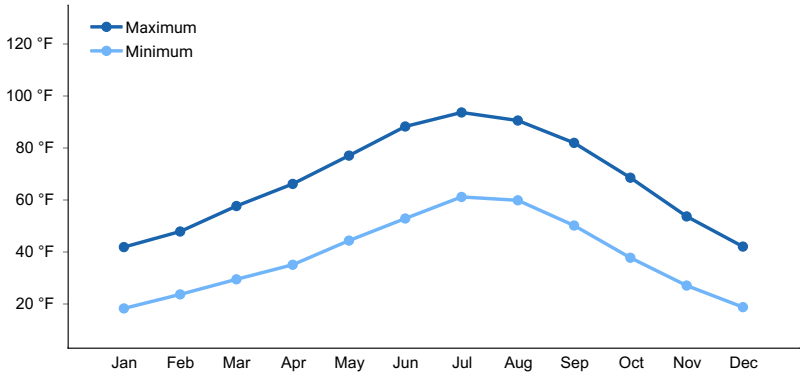

Figure 2. Monthly average minimum and maximum temperature

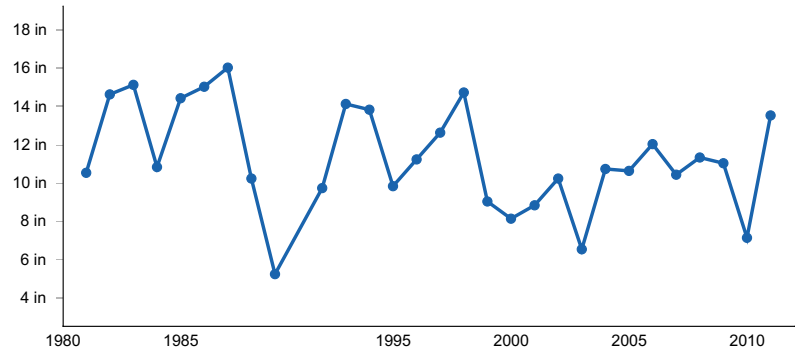

Figure 3. Annual precipitation pattern

Climate stations used

- (1) HOVENWEEP NM [USC00424100], Monticello, UT

Influencing water features

This are no water features in this ecological site.

Soil features

The soils in this site are shallow to moderately deep and well drained. The surface layer is pale brown to grayish silty clay loam. Surface texture range in clay percent from 30 to 45% clay. The underlying layers are pale brown to

grayish brown silty clay or clay loam. Subsoil at 20" in depth range from 30 to 50% clay.

These soils are on hills, ridges, and low alluvial terraces. They are formed in residuum and alluvium from shale and limestone.

Intake rate is slow to very slow. These soils have a low to moderate available water holding capacity.

Soils associated with this site from shale (Mancos and Morrison Shale) are: Vananda, Zyme and Bodot. Calcium carbonate is 1 to 10%

Soils associated with this site from limestone: Greycap. Greycap soils have Calcium carbonate of 45 to 65%

Billings soil is associated with this site and needs to be evaluated as it is a deep soil and Typic Torrifluvent which means it has a water table for some parts of the year which does not fit this site.

Table 4. Representative soil features

Parent material	(1) Residuum–shale (2) Alluvium–limestone
Surface texture	(1) Silty clay loam (2) Clay loam (3) Silty clay
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Very slow to moderately slow
Soil depth	6–40 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0–5%
Available water capacity (0-40in)	3.1–6.1 in
Calcium carbonate equivalent (0-40in)	1–10%
Electrical conductivity (0-40in)	0–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0–5%

Ecological dynamics

MLRA 36 occurs on the higher elevation portion of the Colorado Plateau. The Colorado Plateau is a physiographic province which exists throughout eastern Utah, western Colorado, western New Mexico and northern Arizona. It is characterized by uplifted plateaus, canyons and eroded features. The Colorado Plateau lies south of the Uintah Mountains, north of the Mogollon transition area, west of the Rocky Mountains, and east of the central Utah highlands. The higher elevation portion of the Colorado Plateau which is represented by MLRA 36 is characterize by broken topography, and lack of perennial water sources. This area has a long history of past prehistoric human use for thousands of years. MLRA 36 shows archaeological evidence indicating that pinyon-juniper woodlands where modified by prehistoric humans and not pristine and thus where altered at the time of European settlement

(Cartledge & Propper, 1993). This area also included natural influences of herbivory, fire, and climate. This area rarely served as habitat for large herds of native herbivores or large frequent historic fires due to the broken topography. This site is extremely variable and plant community composition will vary with the water fluctuations on this site.

There is a winter-summer bimodal precipitation pattern on this part of the Colorado Plateau. Meaning that this site developed under climatic conditions that include wet, cold winters, and hot, dry summers with summer rains. This area has climatic fluctuations and prolonged droughts are common occurrences. Between an above average year and a drought year, forbs are the most dynamic (Passey et.al. 1982) and can vary up to 4 fold. The precipitation and climate of MLRA 36 are conducive to producing Pinyon/juniper, and sagebrush complexes with high productive sites in the bottoms of the canyons. Predominant species on the Colorado Plateau are Wyoming big sagebrush (*Artemisia tridentata* var. wyomingensis), mountain big sagebrush (*A. tridentata* var. vaseyana), and black sagebrush (*A. nova*), Basin Big Sagebrush (*A. tridentata* var. tridentata), Utah Juniper (Juniperus utahensis) and Pinyon (*Pinus edulis*).

The following is from the 1988 Range site (SCS, 1981):

Galleta and western wheatgrass are the major grasses. There are lesser amounts of Indian ricegrass, bottlebrush squirreltail, and blue grama. Showy forbs are Pursh locoweed, deserttrumpet eriogonum, Gordon eriogonum, desert princesplume, scarlet globemallow and onion spring parsley. Black sagebrush, winterfat, dwarf rabbitbrush, and Wyoming big sagebrush are the major shrubs.

If ecological retrogression is cattle induced, black sagebrush, stickyleaf low rabbitbrush, winterfat, Wyoming big sagebrush, and Fendler threeawn increase. Western wheatgrass battlebrush squirreltail, Indian ricegrass and Nevada bluegrass would decrease with early spring grazing. Galleta would decrease with summer grazing. If retrogression is caused by sheep, desirable forbs and grasses decrease. Winterfat and Wyoming big sagebrush would decrease with winter and early spring grazing. Plant species most likely to invade the sire are cheatgrass, sixweeks fescue, annual sunflower, mustard, sticktight, Russian thistle, black greasewood, and broom snakeweed.

The aspect of this site is a mixed grass-shrub community. Grasses make up 25 to 50 percent; while forbs are 10 to 15 percent; and shrubs are 25 to 35 percent of the plant community by air-dry weight.
Variability in climate, soils, aspect and complex biological processes will cause the plant communities to differ. These factors contributing to annual production variability include wildlife use, drought, and insects. Factors contributing to special variability include soil texture, depth, rock fragments, slope, aspect, and micro-topography. The species lists are representative and not a complete list of all occurring or potentially occurring species on this site. The species lists are not intended to cover the full range of conditions, species and responses of the site. The State & Transition model depicted for this site is based on available research, field observations and interpretations by experts and could change as knowledge increases. As more data is collected, some of these plant communities may be revised or removed, and new ones may be added. The following diagram does not necessarily depict all the transitions and states that this site may exhibit, but it does show some of the most common plant communities.

State and transition model

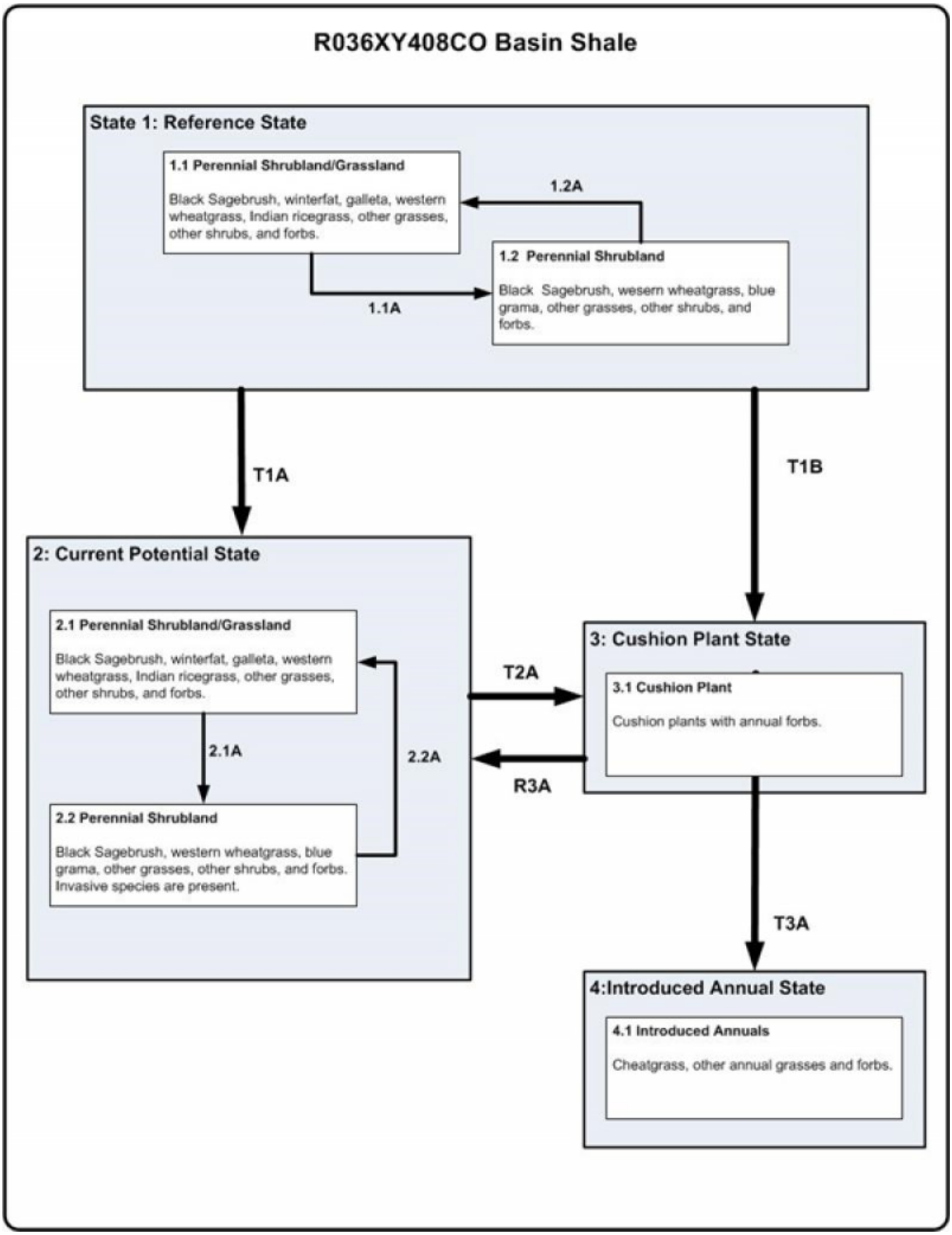
R036XY408CO Basin Shale
State 1: Reference State
1.1 Perennial Shrubland/Grassland
Black Sagebrush, winterfat, galleta, western wheatgrass, Indian ricegrass, other grasses, other shrubs, and forbs.
1.2A
1.2 Perennial Shrubland
Black Sagebrush, wesern wheatgrass, blue grama, other grasses, other shrubs, and forbs.
1.1A
T1A
T1B
2: Current Potential State
2.1 Perennial Shrubland/Grassland
Black Sagebrush, winterfat, galleta, western wheatgrass, Indian ricegrass, other grasses, other shrubs, and forbs.
2.1A
2.2A
2.2 Perennial Shrubland
Black Sagebrush, western wheatgrass, blue grama, other grasses, other shrubs, and forbs. Invasive species are present.
T2A
R3A
3: Cushion Plant State
3.1 Cushion Plant
Cushion plants with annual forbs.
T3A
4:Introduced Annual State
4.1 Introduced Annuals
Cheatgrass, other annual grasses and forbs.

Figure 5. STM

Legend

1.1A – Fire
1.2A, 2.2A – Time without disturbance and Continuous grazing of perennial grasses
T1A – Establishment of invasive species
R3A – Brush removal and seeding
T3A – repeated fire in short time spans
2.1A – Fire and Brush removal
T1B,T2A – Disturbance (human, mechanic and/or animal), continuous grazing of perennial grasses and black sagebrush

Figure 6. Basin Shale STM Legend

State 1
Reference State

The reference state is a perennial bunchgrass/shrub community. This site is treeless. The appearance of this site is grassland in association with woody shrubs, such as black sagebrush, and several forbs. These species account for most of the vegetative cover. Western wheatgrass, galleta, Indian ricegrass, blue grama, bottlebrush squirreltail, and Sandberg bluegrass contribute toward a rather sparse grassland appearance. Black sagebrush has a noticeable place on this site. Hood's phlox, winterfat, buckwheat, and fringed sage are common. Fluctuations in species composition and relative production may change from year to year depending upon precipitation and other climatic factors. Black sagebrush communities historically experienced an extended fire return interval due to widely spaced shrubs and low herbaceous (fine fuel) production. Establishment of sagebrush seedlings occurs solely from seed and recruitment pulses are episodic, based on favorable climatic conditions. Black sagebrush can be heavily browsed and should be monitored to assure new young seedlings are establishing in numbers high enough to replace the current stand of black sagebrush. Drought can compound the problem of heavy browsing. (Winward, 2004).

Community 1.1
Perennial Shrubland/Grassland

The "bald" appearance of this range site due to the absence of large shrubs. Grasses and cushion type forbs characterize the site. Important grasses are, western wheatgrass, galleta, Indian ricegrass, and squirreltail. Cushion type and mat forming forbs and shrubs found on this site include fringed sagebrush, yellow rabbitbrush, buckwheat, Hood’s phlox (spiny phlox), globemallow, and spring parsley. This plant community is long-lived, stable and rarely experiences natural large scale disturbance. This plant community is represented by small scale disturbances which has removed patches of mature vegetation. Initially, disturbed areas are dominated by grasses and forbs. The grasses and forbs benefits from reduced competition from the absence of shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	150	170	285
Shrub/Vine	115	180	250
Forb	35	50	65
Total	**300**	**400**	**600**

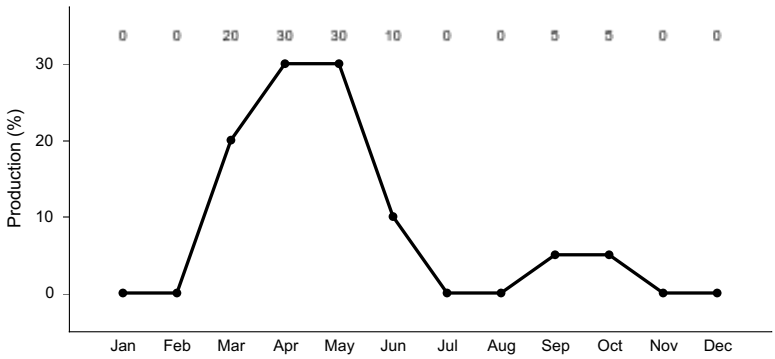

Figure 8. Plant community growth curve (percent production by month). CO0102, Semidesert Sites.

Community 1.2
Perennial Shrubland

Sandberg bluegrass, blue grama, yellow rabbitbrush, Hood's phlox, and black sagebrush will increase with mismanaged grazing. There are a few remnant herbaceous plants under the sagebrush but the number of understory plants left might not be able to re-seed the site if there was a disturbance event. The sagebrush would be single age stand. Sandberg bluegrass and western wheatgrass will increase and prairie Junegrass would decrease to get to this community phase. Also, low, less palatable shrubs such as yellow rabbitbrush and snakeweed will increase and replace part of the herbaceous component. Lack of an understory helps to suppress low intensity fires as there is no fuel to carry the fire unless it is a high intensity fire. Increased sagebrush canopy can be due to lack of disturbance such as wildfire. Cumulating effects of degrading sagebrush habitats could include: higher erosion and sedimentation, decreased water quality, declines in forage base for domestic livestock, and decreased habitat for wildlife species (McIver, et al, 2010). This phase is losing species diversity compared with phase 1.1.

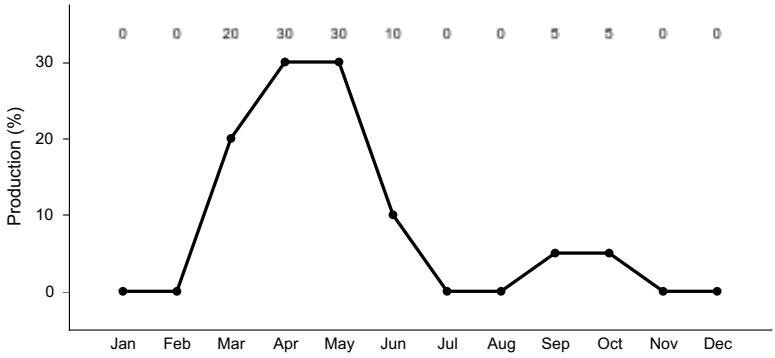

Figure 9. Plant community growth curve (percent production by month). CO0102, Semidesert Sites.

Pathway 1.1A
Community 1.1 to 1.2

This pathway is from improper grazing and lack of fire or other disturbances. Improper grazing can decrease the understory, increase sagebrush canopy, and shorten the time span it takes to transition back to reference community phase 1.1. Extended drought and improper grazing can shorten the time frame of this transition. Improper browsing and suitable grazing on the understory species can cause this shift, along with frequent fires prior to seed set for the sagebrush but after seed set for the understory, and large scale insect or pathogen die-off of the sagebrush could cause this pathway (Evers et al, 2011).

Pathway 1.2A
Community 1.2 to 1.1

This community is derived from fire with natural occurring fire return intervals and intensities characterizing this pathway (McIver, et al, 2010). Fire only occurs on this site in normal and more frequently in above normal

precipitation years. This site needs normal or above average precipitation to carry a fire because this produces the fine fuels necessary to carry a fire on this site. Wildfire, prolonged drought and/or disease/insect attack will kill shrubs. Proper grazing management including proper timing of grazing and restoration periods will allow native bunchgrasses and perennial forbs revert towards Community Phase 1.1. Shrub management including herbicide application and mowing can be used to mimic this pathway. Drought and prescribed grazing or improper grazing can influence the timeframe of this community pathway. Management practices should be aimed at restoring the associated forb and grass species that historically helped cover openings between black sagebrush crowns. (Winward, 2004).

State 2
Current Potential State

State 2 is identical to State 1 in form and function, with the exception of the presence of non-native plants.

Community 2.1
Perennial Shrubland/Grassland

This plant community is a black sagebrush-dominated stand and associated grasses such as western wheatgrass, galleta, Indian ricegrass, Sandberg bluegrass, and bottlebrush squirreltail. Phlox, buckwheat, locoweed, and globemallow are commonly associated forbs. Introduced species such as cheatgrass are present in the community but are in trace amounts.

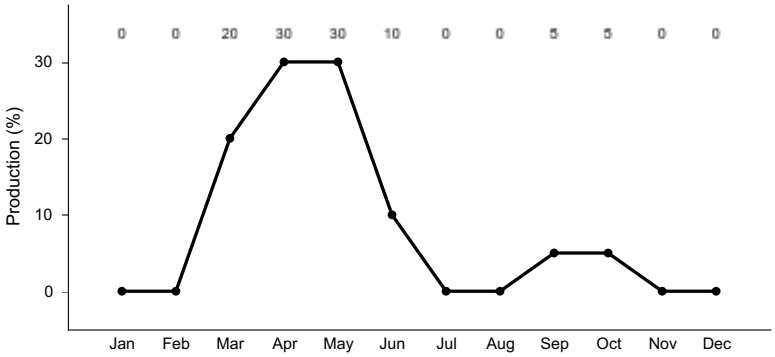

Figure 10. Plant community growth curve (percent production by month). CO0102, Semidesert Sites.

Community 2.2
Perennial Shrubland

This plant community would be similar to 1.2 except now after European settlement there is not invasive species such as cheatgrass introduced into the state.

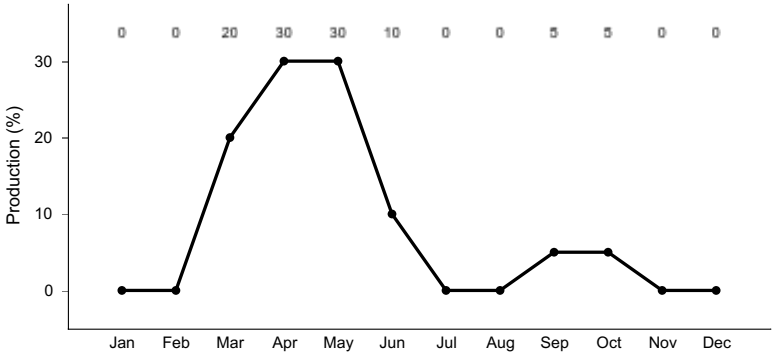

Figure 11. Plant community growth curve (percent production by month). CO0102, Semidesert Sites.

Pathway 2.1A
Community 2.1 to 2.2

This pathway is from improper grazing and lack of fire or other disturbances. Improper grazing can decrease the understory, increase sagebrush canopy. Extended drought and improper grazing can shorten the time frame of this transition. Improper browsing and suitable grazing on the understory species can cause this shift, along with frequent fires prior to seed set for the sagebrush but after seed set for the understory, and large scale insect or pathogen die-off of the sagebrush could cause this pathway (Evers et al, 2011).

Pathway 2.2A
Community 2.2 to 2.1

This community is derived from fire with natural occurring fire return intervals and intensities characterizing this pathway (McIver, et al, 2010). Fire only occurs on this site in normal and more frequently in above normal precipitation years. This site needs normal or above average precipitation to carry a fire because this produces the fine fuels necessary to carry a fire on this site. Wildfire, prolonged drought and/or disease/insect attack will kill shrubs. Proper grazing management including proper timing of grazing and restoration periods will allow native bunchgrasses and perennial forbs revert towards Community Phase 2.1. Shrub management including herbicide application and mowing can be used to mimic this pathway. Drought and prescribed grazing or improper grazing can influence the timeframe of this community pathway. Management practices should be aimed at restoring the associated forb and grass species that historically helped cover openings between black sagebrush crowns. (Winward, 2004).

State 3
Cushion Plant State

This site is represented by frequently and heavily browsed black sagebrush during the winter and is browsed by wildlife. Heavily browsed black sagebrush becomes rounded instead of the typical irregular, spreading and u-shaped crown it normally has. Black sagebrush can be almost level along the ground with severe browsing. (Fryer, 2009). This state is at risk for excessive wind and water erosion and the biotic integrity of the site is at risk. The bareground has increased on this site and the interspaces between plants are larger. Black sagebrush is still present on the site and may dominant the shrub cover. Black sagebrush with be approximately 2-4 inches in height rather than the 4-12 inches that is common without browsing. Plants such as Sandberg bluegrass, western wheatgrass, yellow rabbitbrush and low growing forbs such as hood’s phlox will dominant the site.

Community 3.1
Cushion Plant

Small stature and cushion plants are found in this community phase. Plants such as spiny phlox, granite prickly phlox, spring parsley, twinpod, blue grama, Sandberg bluegrass and broom snakeweed can be in this community.

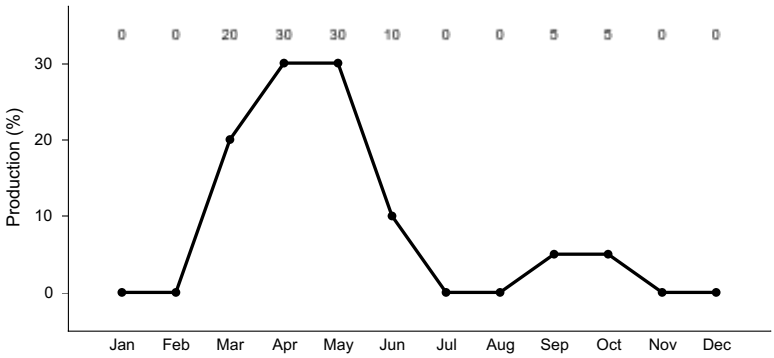

Figure 12. Plant community growth curve (percent production by month). CO0102, Semidesert Sites.

State 4
Introduced Annual State

This state can develop when fire return intervals are frequent and lack of native perennial understory is sparse or absent.

Community 4.1
Introduced annuals

Introduced annuals and biennial forbs can be found on this plant community. Plants such as cheatgrass, Russian thistle, halogeton, annual sunflower and western salsify can be typically found on this community.

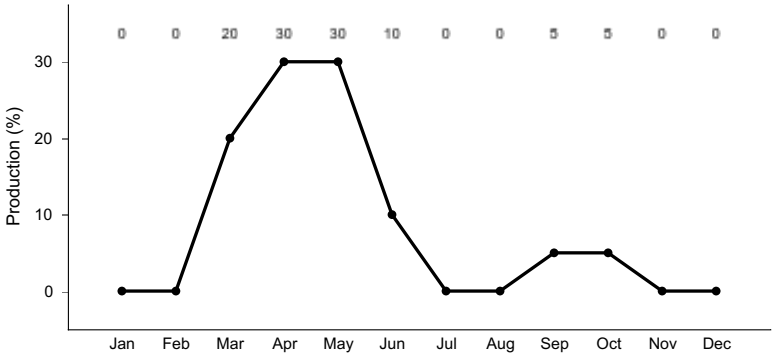

Figure 13. Plant community growth curve (percent production by month). CO0102, Semidesert Sites.

Transition T1A
State 1 to 2

The introduction of introduced invasive plant species will cause State 1 to transition to State 2. A return pathway back to State 1 would be impracticable because of introduced species and climate change.

Transition T1B
State 1 to 3

There are several mechanisms for this ways this transition happens. The first way from long term excessive year-long livestock grazing, trampling and bedding, especially by large flocks of domestic sheep, prolonged animal bedding, salting, watering, and handling locations are examples of uses that can accelerate this transition. The second is long term long-term damage caused by trail and road development, and/or excessive trail development. The third way it develops is by long term herbivory by wildlife and upland species that select out the shrubs and grass, this can happen in an area where the site is on ridges and hills where the snow melts and allows use year round for livestock and wildlife habitat. The only plants remaining are those tolerant of drought, infertile soil, mechanical disturbances, and herbivory. Also, it can also be a combination of the three ways in varying proportions.

Transition T2A
State 2 to 3

There are several mechanisms for this ways this transition happens. The first way from long term excessive year-long livestock grazing, trampling and bedding, especially by large flocks of domestic sheep, prolonged animal bedding, salting, watering, and handling locations are examples of uses that can accelerate this transition. The second is long term long-term damage caused by trail and road development, and/or excessive trail development. The third way it develops is by long term herbivory by wildlife and upland species that select out the shrubs and grass, this can happen in an area where the site is on ridges and hills where the snow melts and allows use year round for livestock and wildlife habitat. The only plants remaining are those tolerant of drought, infertile soil, mechanical disturbances, and herbivory. Also, it can also be a combination of the three ways in varying proportions.

Restoration pathway R3A
State 3 to 2

This plant community can move back towards the Current potential State phase when grazing and/wildlife management takes place only during the non-growing season of the herbaceous component, along with broadcast re-seeding with native perennial forbs and grasses.

Transition T3A
State 3 to 4

This state can develop when fire return intervals are frequent and lack of native perennial understory is sparse or absent.

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	**Grasses**			100–240	
	western wheatgrass	PASM	*Pascopyrum smithii*	40–60	–
	James' galleta	PLJA	*Pleuraphis jamesii*	40–60	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	10–20	–
	blue grama	BOGR2	*Bouteloua gracilis*	10–20	–
	squirreltail	ELEL5	*Elymus elymoides*	10–20	–
	needle and thread	HECO26	*Hesperostipa comata*	0–10	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	0–10	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–10	–
Forb					
2	**Forbs**			40–60	
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	5–10	–
	desert princesplume	STPIP	*Stanleya pinnata var. pinnata*	5–10	–
	bulbous springparsley	CYBU	*Cymopterus bulbosus*	5–10	–
	Gordon's buckwheat	ERGO	*Eriogonum gordonii*	0–10	–
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–10	–
	Fremont's beardtongue	PEFR	*Penstemon fremontii*	5–10	–
	sharpleaf twinpod	PHAC4	*Physaria acutifolia*	0–5	–
	spiny phlox	PHHO	*Phlox hoodii*	0–5	–
	longleaf phlox	PHLO2	*Phlox longifolia*	0–5	–
	tufted evening primrose	OECA10	*Oenothera caespitosa*	0–5	–
	woollypod milkvetch	ASPU9	*Astragalus purshii*	0–5	–
	sego lily	CANU3	*Calochortus nuttallii*	0–5	–
Shrub/Vine					
3	**Shrubs**			120–240	
	black sagebrush	ARNO4	*Artemisia nova*	40–75	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	20–40	–
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	10–20	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	10–20	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	10–20	–
	longflower rabbitbrush	CHDE2	*Chrysothamnus depressus*	10–20	–
	yellow rabbitbrush	CHVIV2	*Chrysothamnus viscidiflorus ssp. viscidiflorus*	10–20	–
	prairie sagewort	ARFR4	*Artemisia frigida*	5–10	–
	thrift mock goldenweed	STARA	*Stenotus armerioides var. armerioides*	0–5	–

Animal community

This section is from the 1981 Range site.

INTERPRETATIONS FOR GRAZING ANIMALS:
This site provides fall, winter, and spring forage for cattle, sheep, horses, mule deer, and small mammals. Spring deferment is needed periodically to maintain desirable species in the plant community.

Guide to Initial Stocking Rates 3/

Condition	% Climax	Ha/AUM	Ac/AUM	AUM/HA	AUM/AC
Excellent	76-100	3.2-5.1	8-11	.31-.19	.12-.09
Good	51-75	5.1-8.5	11-17	.19-.12	.09-.06
Fair	26-50	8.5-15.8	17-34	.12-.06	.06-.02
Poor	0-25	15.8-20.7	34+	.06-.04	.02+

3/ Stocking rates are based on an average growing season and based on 540 kg of forage (air-dry) per animal unit month. (This figure takes into account the vegetation that disappears through trampling, small herbivores, etc., which amounts to approximately 3.6 kg/day under normal conditions.)

Annual production
In excellent conditions, the approximate total annual production (air-dry) is:
Favorable years 675 kg/ha (600 lb/Ac)
Normal years 450 kg/ha (400 lb/Ac)
Unfavorable years 337 kg/ha (300 lb/Ac)

Of this production, 30 to 35 percent will likely be unpalatable or out of reach of grazing animals.

INTERPRETATIONS FOR WILDLIFE:
This site provides habitat for a variety of wildlife at least part of the year. Species include rabbits, eagles, hawks, owls, coyote, songbirds, small mammals, and reptiles. Mule deer use the area during winter and spring.

Hydrological functions

Soils were originally assigned to hydrologic soil groups based on measured rainfall, runoff, and infiltrometer data (Musgrave 1955). Since the initial work was done to establish these groupings, assignment of soils to hydrologic soil groups has been based on the judgment of soil scientists. Assignments are made based on comparison of the characteristics of unclassified soil profiles with profiles of soils already placed into hydrologic soil groups. Most of the groupings are based on the premise that soils found within a climatic region that are similar in depth to a restrictive layer or water table, transmission rate of water, texture, structure, and degree of swelling when saturated, will have similar runoff responses. Four (4) Hydrologic Soil Groups are recognized (A-D). For specific definitions of each hydrologic soil group see the National Engineering Handbook, Chapter 7, Part 630 Hydrology, or visit:http://policy.nrcs.usda.gov/OpenNonWebContent.aspx? content=22526.wba

The hydrologic soil groups are based on the following factors:

-intake and transmission of water under the conditions of maximum yearly wetness (thoroughly wet)
- soil not frozen
- bare soil surface
- maximum swelling of expansive clays

The slope of the soil surface is not considered when assigning hydrologic soil groups. In its simplest form, the hydrologic soil group is determined by the water transmitting soil layer with the lowest saturated hydraulic conductivity and depth to any layer that is more or less water impermeable (such as a fragipan or duripan) or depth to a water table (if present) (Caudle, et. al, 2013). The runoff curve numbers are determined by field investigations using hydrologic cover conditions and hydrologic soil groups.

Soils Hydrologic Group

Shallow Soils:
Bodot D
Greycap D

Zyme D

Deep Soils:
Billings C
Vananda D

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms (Soil Survey Staff, 2015).

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission (Soil Survey Staff, 2015).

Recreational uses

This section is from the 1981 Range site.

Recreation and Natural Beauty; this site has fair to poor aesthetic appeal and natural beauty.

Wood products

No wood products are produced on this site.

Other information

This section is from the 1981 Range site.

Threatened and Endangered Plants and Animals:
(To be added when known.)

Major Poisonous Plants to Livestock:

Desert princesplume (Stanleya pinnata) - when feed to horses, and is scarce for cattle and sheep

Effects on Animals

Plants that grow on Cretaceous or Eocene shale soils bearing selenium may affect animals. When plants are crushed in the hand, a sulfurous odor is given off. In acute cases of selenium poisoning, animals walk aimlessly into objects. “Blind staggers” or alkali disease are names given for the disease. Hoofs grow abnormally with the formation of deep rings. The hair falls out, especially the mane and tail of horses. Recovery of animals affected may take several months or years. Even after being placed on good forage.

Pursh locoweed (Astragalus purshii) when forage for horses and is scarce cattle and sheep.

Effects on Animals

Pursh locoweed may be poisonous to horses, cattle, and sheep and should be considered potentially dangerous. Irregular gate, loss of flesh and loss of muscular control are the symptoms.

Field office where this site occurs is Norwood.

Type locality

Location 1: San Miguel County, CO	
General legal description	About 6 miles west of Dry Creek Basin store in San Miguel County (sec 16 and 21).

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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 is required to refine the Plant Production and Annual Production tables for this ecological site. The extent of MLRA 36 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)	Suzanne Mayne-Kinney
Contact for lead author	
Date	03/10/2017
Approved by	Rachel Murph, State Rangeland Management Spec., USDA NRCS Colorado
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None to slight on low slopes (<15%). Very minor rill development may occur as slope increases. Rills can be more defined on slopes ranging from 15-25%, especially following intense storms. If rills are present, they should be widely spaced and not connected.

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2. **Presence of water flow patterns:** Water flow patterns will be very short if present and narrow. They should be interrupted by plants and possible bedrock. Flow patterns may be around surface rock and perennial plant bases and show minor evidence of erosion. Flow paths becoming more apparent on slopes exceeding 15%.

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3. **Number and height of erosional pedestals or terracettes:** May have slight pedestalling on the plants' down slope side. Terracettes should very few, if at all. Frost heaving of shallow rooted plants should not be considered an indicator of

erosional pedestaling. Pedestals may occur more frequently on steeper slopes wind exposed slopes.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Expect 15-30% bare ground. Exposed bedrock and sometimes gravel are on this site. When they are present; they are considered rock. Extended drought can cause bare ground to increase.

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

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Wind scouring is possible where surface roughness (rock and/or fragments) is lacking and occurs regardless of season.

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7. **Amount of litter movement (describe size and distance expected to travel):** Fine litter from grasses and perennial and annual forbs) movement is extensive due to the windswept nature of this site and with summer thunderstorms. More persistent larger woody litter from shrubs is expected to remain in place except during large events.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil surface textures are silty clay loam. These soils have a water erosion hazard of slight or moderate. Litter accumulation and cryptogamic crusts reduce erosion.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface texture is usually a silty clay loam. Soils are shallow and occasionally moderately deep. The A-horizon is 3-9 inches in depth. Structure is weak/moderate fine granular or moderate medium platy structure to strong very fine granular structure.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Perennial herbaceous plants slow runoff and increase infiltration. Low basal and canopy cover with inherent interspaces between plants allow for some overland flow, providing a lost opportunity for infiltration to occur.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. Subsurface argillic horizons commonly found on this site should not be interpreted as compaction. Also, most soils have bedrock at approximately 10 to 25 inches.

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

    Dominant: Perennial grasses (western wheatgrass, galleta, squirreltail, Indian ricegrass> non-sprouting shrubs (Black Sagebrush)>

    Sub-dominant: forbs> sprouting shrubs (winterfat)

Other:

Additional: Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species in the reference state (e.g. Crested wheatgrass and Russian wildrye etc.) The perennial grass/non-sprouting shrub functional groups are expected on this site. Perennial and annual forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions. Disturbance regime includes drought, insects, and fire. Assumed fire cycle of 50-70+ years. Following a recent disturbance such as fire or drought that removes the woody vegetation, forbs and perennial grasses (herbaceous species) may dominate the community. If a disturbance has not occurred for an extended period of time, woody species may continue to increase crowding out the perennial herbaceous understory species. In either case, these conditions would reflect a functional community phase within the reference state.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Typically minimal. Expect slight shrub and grass mortality/decadence due to wind desiccation, during and following drought or lack of disturbance.

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14. **Average percent litter cover (%) and depth (in):** 5-15% litter between plant interspaces and under the shrubs at < 0.25 inch depth.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 300 lbs. /ac. low precipitation years; 400 lbs. /ac. average precipitation years; 600 lbs. /ac. above average precipitation years. After extended drought or the first growing season following wildfire, production may be significantly reduced by 100 - 200 lbs. /ac. or more.

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

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17. **Perennial plant reproductive capability:** The only limitations are wind, weather-related, wildfire, natural disease, inter-species competition, wildlife, and insects that may temporarily reduce reproductive capability.
