

United States Department of Agriculture Natural Resources Conservation Service Ecological Site Description

Section I: Ecological Site Characteristics Ecological Site Identification and Concept

Site stage: Provisional

Provisional: an ESD at the provisional status represents the lowest tier of documentation that is releasable to the public. It contains a grouping of soil units that respond similarly to ecological processes. The ESD contains 1) enough information to distinguish it from similar and associated ecological sites and 2) a draft state and transition model capturing the ecological processes and vegetative states and community phases as they are currently conceptualized. The provisional ESD has undergone both quality control and quality assurance protocols. It is expected that the provisional ESD will continue refinement towards an approved status.

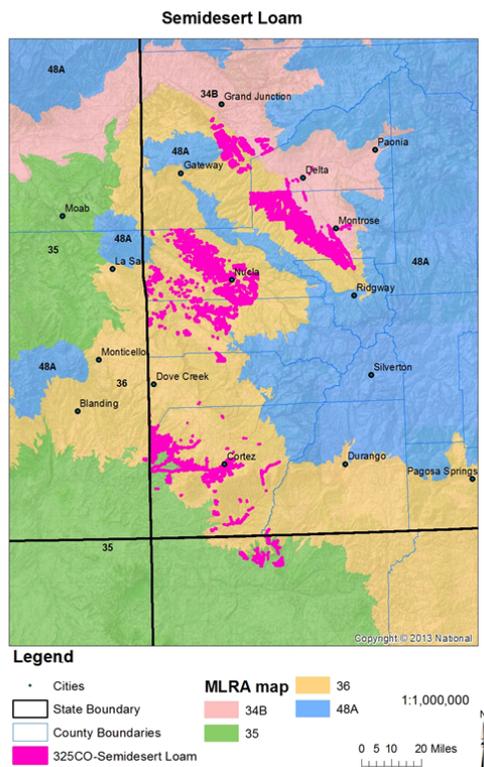
Site name: Semidesert Loam

Artemisia tridentata subsp. wyomingensis / *Pleuraphis jamesii* - *Achnatherum hymenoides*
(/ Wyoming big sagebrush / James' galleta - Indian ricegrass)

Site type: Rangeland

Site ID: R036XY325CO

Major land resource area (MLRA): 036-Southwestern Plateaus, Mesas, and Foothills



Semidesert Loam Location Map

Semi-desert Loam ecological site is found on benches and sloping mesa in MLRA 36. 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 s 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 Wyoming big sagebrush.

Ecological Site Concept

The 36X Semidesert Loam was drafted from the existing Semidesert Loam Range Site 35X (SCS, April, 1981). This site was written prior to MLRA 36 being mapped in Colorado and this area was in MLRA 34X/35X when it was written. This site occurs on benches, sloping mesas

and alluvial fans on moderately deep to deep soils derived mainly from alluvium from sandstone and shale. The soil textures range from fine sandy loam to clay loam. It is a Wyoming big sagebrush – galleta community. It has an ustic aridic moisture regime and mesic temperature regime. The effective precipitation ranges from 9 to 12 inches.

Physiographic Features

This site occurs on structural benches, dipslopes, dipslopes on cuestas, alluvial fans, mesas, hills, valley floor and terraces. Slopes typically range from 1-25%, and elevations are generally 5000-6800 ft.

Landform: (1) Structural bench
(2) Dipslope
(3) Cuesta

	<u>Minimum</u>	<u>Maximum</u>
<i>Elevation (feet):</i>	5000	6800
<i>Slope (percent):</i>	1	25
<i>Flooding</i>		
<i>Frequency:</i>	None	None
<i>Ponding</i>		
<i>Frequency:</i>	None	None
<i>Runoff class:</i>	Low	High
<i>Aspect:</i>	No Influence on this site	

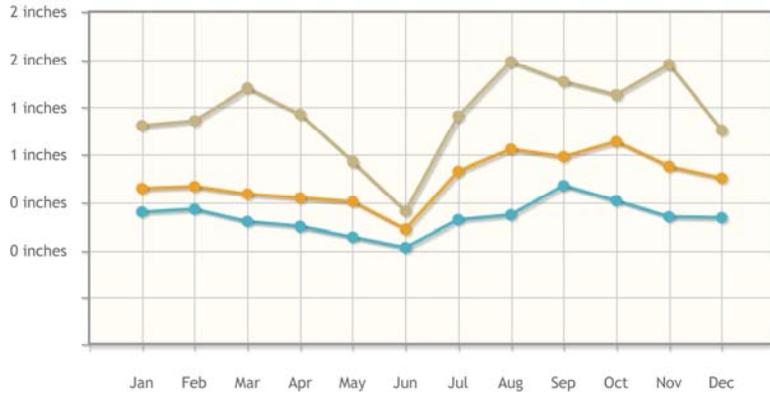
Climatic Features

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 50°F to 54°F, averaging about 33°F for the winter and 61°F through the growing season, March through October. Summer temperatures of 100°F 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 49°F. Average annual temperature is 51.9°F. The coldest winter temperature recorded was -24°F on December 24, 1990 and the coldest summer temperature recorded was 26°F on June 12, 1970. The hottest day on record is 106 °F 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 data in the zone. Typical warm dry weather in late spring and early summer puts warm season plants at a distinct disadvantage compared to plants that grow earlier on stored winter moisture and spring rains. Deep storage of winter moisture allows sagebrush and small trees to compete strongly with shallower rooted grasses during this dry period where other factors encourage their spread.

	<u>Averaged</u>
<i>Frost-free period (days):</i>	131
<i>Freeze-free period (days):</i>	146
<i>Mean annual precipitation (inches):</i>	11.24

Monthly Precipitation (Inches):

	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>
<i>High</i>	1.31	1.36	1.70	1.43	0.93	0.41	1.41	1.98	1.77	1.63	1.95	1.26
<i>Medium</i>	0.65	0.67	0.59	0.55	0.51	0.22	0.83	1.06	0.98	1.14	0.88	0.76
<i>Low</i>	0.40	0.43	0.30	0.25	0.14	0.03	0.32	0.37	0.68	0.52	0.35	0.34



Monthly Temperature (°F):

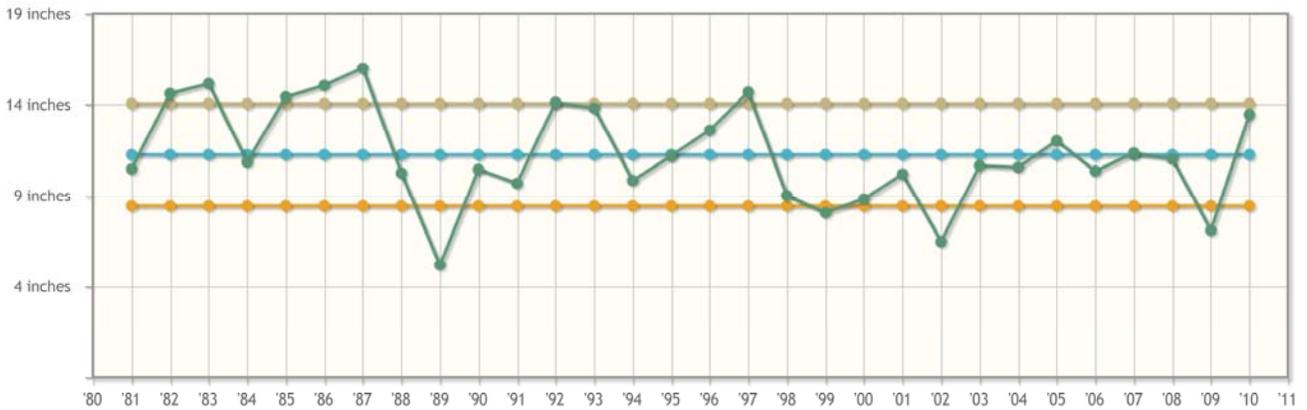
	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>
High	41.6	47.6	57.4	65.9	76.8	88.0	93.4	90.3	81.7	68.3	53.4	41.8
Low	18.0	23.4	29.2	34.8	44.1	52.6	60.9	59.6	49.9	37.5	26.8	18.5



30 Year Annual Rainfall (inches):

<u>1981 N</u>	<u>1982 H</u>	<u>1983 H</u>	<u>1984 N</u>	<u>1985 H</u>	<u>1986 H</u>	<u>1987 H</u>	<u>1988 N</u>	<u>1989 D</u>	<u>1990 N</u>	<u>1991 N</u>	<u>1992 H</u>	<u>1993 N</u>	<u>1994 N</u>	<u>1995 N</u>
10.46	14.59	15.13	10.84	14.41	15.04	15.99	10.24	5.19	10.44	9.68	14.12	13.8	9.83	11.17
<u>1996 N</u>	<u>1997 H</u>	<u>1998 N</u>	<u>1999 D</u>	<u>2000 N</u>	<u>2001 N</u>	<u>2002 D</u>	<u>2003 N</u>	<u>2004 N</u>	<u>2005 N</u>	<u>2006 N</u>	<u>2007 N</u>	<u>2008 N</u>	<u>2009 D</u>	<u>2010 N</u>
12.59	14.67	9	8.05	8.82	10.18	6.48	10.65	10.55	12	10.35	11.33	11	7.1	13.46

D-Drought N-Normal H-Heavy



Climate stations: (1) HOVENWEEP NM [USC00424100], San Juan County UT 84534. Period of record 1981-2010

Influencing Water Features

There are no water features associated with this site.

Wetland Description (Cowardin System)

System	Subsystem	Class
None	N/A	N/A

Representative Soil Features

The soils in this site are moderately deep to deep, and well drained. The soils formed in eolian and alluvial materials derived mainly from sandstone or sandstone and shale. The surface layer is light brown to reddish brown loam, fine sandy loam, very fine sandy loam or gravelly sandy loam, 2 to 10 inches thick. The soil surface ranges from 14 to 24% clay.

The subsoil ranges from 19 to 32% clay at 20 inches in depth (sandy clay loam, loam and clay loam). Subsoils may have pebbles or gravels present. Permeability ranges from moderately slow to moderate.

The major soils associated with this site are:
Barx, Abra, and Blancot.

Moderately deep soils assigned this site: Gapmesa, Progresso and Hagerman

Parent materials

Kind: Slope alluvium, Eolian deposits, Alluvium

Origin: Sandstone, Sandstone and shale

Surface texture: (1) Loam

(2) Fine sandy loam

(3) Very fine sandy loam

Subsurface texture group: Loamy

	<u>Minimum</u>	<u>Maximum</u>
<i>Surface fragments <=3" (% cover):</i>	0	15
<i>Surface fragments >3" (% cover):</i>	0	2
<i>Subsurface fragments <=3" (% volume):</i>	0	13
<i>Subsurface fragments >3" (% volume):</i>	0	14
<i>Drainage class:</i> Well drained		
<i>Permeability class:</i> Moderately slow to moderate		

	<u>Minimum</u>	<u>Maximum</u>
<i>Depth (inches):</i>	20	
<i>Available water capacity (inches):</i>	4.10	7.40
<i>Electrical conductivity (mmhos/cm):</i>	0	2
<i>Sodium adsorption ratio:</i>	0	1
<i>Calcium carbonate equivalent (percent):</i>	0	10
<i>Soil reaction (1:1 water):</i>	6.6	8.4

Plant Communities

Ecological Dynamics of the Site

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 characterized 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 were modified by prehistoric humans and not pristine and thus were 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*).

This site is influenced by many of the natural disturbances typical of MLRA 36, particularly by fire. Wyoming big sagebrush typically is the dominant plant species; however, with the removal of big sagebrush following a burn, perennial grasses generally dominate the community. Wyoming big sagebrush will begin to re-establish itself in the community within 2-10 years following a fire, given a seed source and average precipitation (Johnson and Payne, 1968). However, it may take more than 10 years for big sagebrush to re-establish in unfavorable conditions (Howard, 1999). Invasive species, particularly cheatgrass, may reduce the resilience of this site following wildfire or management disturbances. Other plants likely to invade this site are annual sunflower, annual mustards, sticktight, and Russian thistle.

Any disturbance that reduces the vigor or establishment of perennial plants will increase the likelihood of establishment of invasive annuals in the understory. (Boyle and Reeder, 2005).

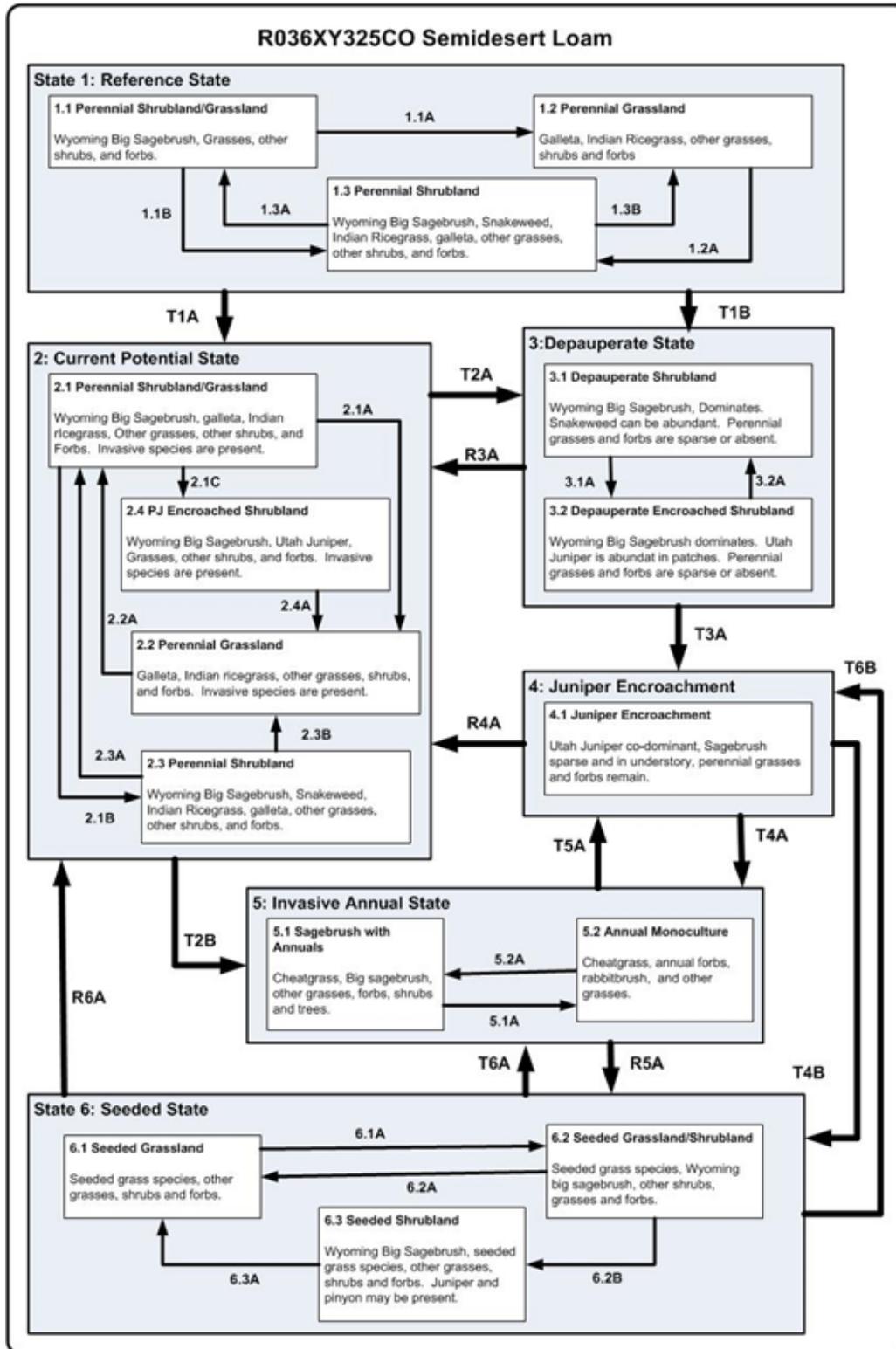
Caution should be used to protect this site from establishment and increased dominance of annual invasive species, particularly cheatgrass, by maintaining or increasing the vigor and establishment of perennial species through proper management. Proximity to roads or other seed vectors will increase the likelihood of invasion by non-native species (Davies and Sheley, 2007). Continuous season-long grazing and/or heavy stocking rates may decrease the vigor and establishment of perennial grass species.

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

"If ecological retrogression is cattle induced, blue grama, galleta, and stickleaf low rabbitbrush, winterfat, Wyoming big sagebrush, and Fendler threeawn increase. Western wheatgrass, bottlebrush squirreltail, and Indian ricegrass would decrease with continuous early spring grazing. Galleta would decrease with continuous summer grazing. If retrogression is caused by sheep, desirable forbs and grasses decrease. Winterfat and Wyoming big sagebrush would decrease with continuous winter and early spring grazing. Plants most likely to invade this site are: cheatgrass, sixweeks fescue, annual sunflower, mustard, sticktight, Russian thistle, and broom snakeweed."

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 Diagram



STM

Legend

Legend

1.1A, 1.1B, 1.3B, 2.4A, 2.3A, 6.2A – fire, insect herbivory, and/or drought
 1.2A, 1.3A, 2.2A, 6.1A, 6.2B, – lack of fire, time without disturbance and improper grazing of perennial grasses
 T1A – Establishment of invasive species
 T1B, T2A – Continuous grazing of perennial grasses
 R3A – Brush removal and seeding
 2.1C, T3A, 3.1A – Time without disturbance
 3.2A – Brush removal
 2.1A, 2.3B, 2.1B – Fire and Brush removal
 R4A, 6.3A – fire, vegetation treatments, insect herbivory, drought, and/or tree encroachment removal
 5.1A – Frequent fire, and/or drought
 5.2A, T5B – fire suppression and/or seeding
 T5A – treat invasive species, and seeding
 R4A, T6B – fire suppression, time without disturbance, insect herbivory, and tree encroachment
 T4A, T6A – invasive species establishment, frequent fire and/or long term drought
 T4B – Seeding and removal of tree encroachment

STM Legend

State 1: Reference State

The reference state represents the expected historical plant communities and ecological dynamics of this site, without the effects of improper grazing, altered fire regime, non-native species, or other human disturbances. The reference state is dominated by big sagebrush and/or perennial grasses. The reference state is self-sustaining, meaning it is resistant to natural disturbances and exhibits high resilience following natural disturbances (Briske et al., 2008). All community phases are at risk of non-native/invasive plant establishment when a seed source and germination sites are available.

Community Phase 1.1: Perennial Shrubland/Grassland

Wyoming big sagebrush is the co-dominant with grasses in this phase. James' galleta and Indian ricegrass dominate the understory, along with a variety of other native perennial grasses. Forbs are a minor component of the plant community. Fourwing saltbush is often present but not dominant.

The following is from 1988 range site:

The aspect of this site is a mixed grass-shrub community. Grasses make up 50 - 60 percent, while forbs are 5 - 10 percent and shrubs 25 - 35 percent, air-dry weight.

Community Phase Pathway 1.1A

Fire removes big sagebrush and perennial bunchgrasses quickly recover and dominate. The natural fire return interval is highly variable depending on fuel levels and climate, but is expected to range between 10-70 years (Howard, 1999) in areas dominated by Wyoming big sagebrush.

Community Phase Pathway 1.1B

Low intensity fire, pathogens, or extended drought thin big sagebrush (Winward, 2004). The natural fire return interval is widely variable depending on fuel levels and climate, and is expected to be between 10-70 years in Wyoming big sagebrush communities (Howard, 1999). Perennial grasses and fourwing saltbush re-sprout, and the grasses dominate the site.

Perennial Shrubland/Grassland Plant Species Composition

Grass/Grasslike					Annual Production (pounds per acre)		Foliar cover (percent)	
Group	Group name	Common name	Symbol	Scientific name	Low	High	Low	High
1		Indian ricegrass	ACHY	Achnatherum hymenoides	30	120		
		Fendler threeawn	ARPUL	Aristida purpurea var. longiseta	12	30		
		blue grama	BOGR2	Bouteloua gracilis	30	60		
		squirreltail	ELELE	Elymus elymoides subsp. elymoides	30	60		
		New Mexico feathergrass	HENE5	Hesperostipa neomexicana	0	90		
		western wheatgrass	PASM	Pascopyrum smithii	12	30		
		James' galleta	PLJA	Pleuraphis jamesii	60	120		
		sand dropseed	SPCR	Sporobolus cryptandrus	12	30		
Forb					Annual Production (pounds per acre)		Foliar cover (percent)	
Group	Group name	Common name	Symbol	Scientific name	Low	High	Low	High
2		freckled milkvetch	ASLE8	Astragalus lentiginosus	0	6		
		sego lily	CANU3	Calochortus nuttallii	0	12		
		trailing fleabane	ERFL	Eriqeron flagellaris	0	12		
		silvery lupine	LUAR3	Lupinus argenteus	0	6		

New Mexico groundsel	PANEM	Packera neomexicana var. mutabilis	0	12
toadflax penstemon	PELI2	Penstemon linarioides	0	12
beardtongue	PENST	Penstemon	0	12
scarlet globemallow	SPCO	Sphaeralcea coccinea	0	12

Shrub/Vine				<u>Annual Production (pounds per acre)</u>		<u>Foliar cover (percent)</u>		
<u>Group</u>	<u>Group name</u>	<u>Common name</u>	<u>Symbol</u>	<u>Scientific name</u>	<u>Low</u>	<u>High</u>	<u>Low</u>	<u>High</u>
3					120	240		
		Wyoming big sagebrush	ARTRW8	Artemisia tridentata subsp. wyomingensis	100	200		
		fourwing saltbush	ATCA2	Atriplex canescens	12	30		
		shadscale saltbush	ATCO	Atriplex confertifolia	0	15		
		yellow rabbitbrush	CHV18	Chrysothamnus viscidiflorus	0	12		
		Cutler's jointfir	EPCU	Ephedra cutleri	0	12		
		mormon tea	EPV1	Ephedra viridis	0	12		
		broom snakeweed	GUSA2	Gutierrezia sarothrae	0	30		
		winterfat	KRLA2	Krascheninnikovia lanata	0	12		
		plains pricklypear	OPPO	Opuntia polyacantha	0	12		

Annual Production by Plant Type

Plant type	Annual Production (lbs/ac)		
	Low	Representative value	High
Grass/Grasslike	240	360	480
Forb	40	60	80
Shrub/Vine	120	180	240
Total	400	600	800

Structure and Cover

Ground Cover

<u>Vegetative cover</u>	<u>Minimum</u>	<u>Maximum</u>
Grasses/grasslikes	5%	10%
Forbs	2%	5%
Shrubs/vines	10%	25%
Trees	0%	0%
Nonvascular plants	0%	0%
Biological crust	15%	35%

<u>Nonvegetative cover</u>	<u>Minimum</u>	<u>Maximum</u>
Litter	5%	25%
Surface fragments >0.25" and <=3"	0%	15%
Surface fragments >3"	0%	2%
Bedrock	0%	0%
Water	0%	0%
Bare ground	5%	15%

Structure of Canopy Cover

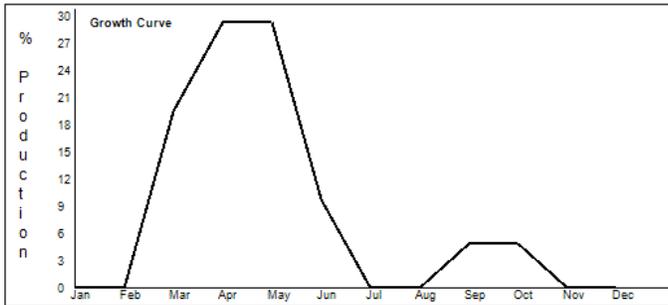
<u>Height above ground</u>	<u>Grasses/grasslikes</u>		<u>Forbs</u>		<u>Shrubs/vines</u>		<u>Trees</u>	
	<u>Minimum</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Maximum</u>
<=0.5 foot	0%	10%	0%	5%	0%	5%	--	--
>0.5 to <1 foot	0%	5%	0%	10%	5%	15%	--	--
>1 to <=2 feet	0%	5%	0%	5%	5%	10%	--	--
>2 to <4.5 feet	--	--	--	--	0%	5%	--	--
>4.5 to <=13 feet	--	--	--	--	--	--	--	--
>13 to <40 feet	--	--	--	--	--	--	--	--
<40 to >=80 feet	--	--	--	--	--	--	--	--
>80 to <120 feet	--	--	--	--	--	--	--	--
>=120 feet	--	--	--	--	--	--	--	--

Plant Growth Curve

<i>Growth curve number:</i>	CO0102
<i>Growth curve name:</i>	MLRA 34B & 36 - Semidesert Sites
<i>Growth curve description:</i>	MLRA 34B and 36

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	20	30	30	10	0	0	5	5	0	0

**Community Phase 1.2: Perennial Grassland**

This phase is dominated by perennial native grasses.

Community Phase Pathway 1.2A

Time without disturbance can result in a natural increase in sagebrush dominance (Welch and Criddle, 2003). Grazing of perennial grasses may decrease the time required for this pathway.

Plant Growth Curve

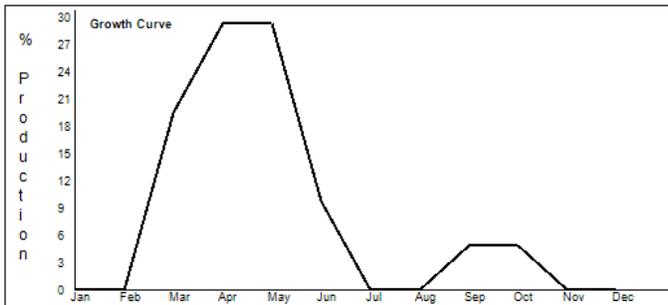
Growth curve number: CO0102

Growth curve name: MLRA 34B & 36 - Semidesert Sites

Growth curve description: MLRA 34B and 36

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	20	30	30	10	0	0	5	5	0	0

**Community Phase 1.3: Perennial Shrubland**

Big sagebrush dominates the plant community with some understory.

The following is from 1988 range site:

The aspect of this site is a mixed grass-shrub community. Grasses make up 50 - 60 percent, while forbs are 5 - 10 percent and shrubs 25 - 35 percent, air-dry weight.

Community Phase Pathway 1.3A

Time without disturbance can result in a natural increase in sagebrush dominance (Welch and Criddle, 2003). Grazing of perennial grasses may decrease the time required for this pathway.

Community Phase Pathway 1.3B

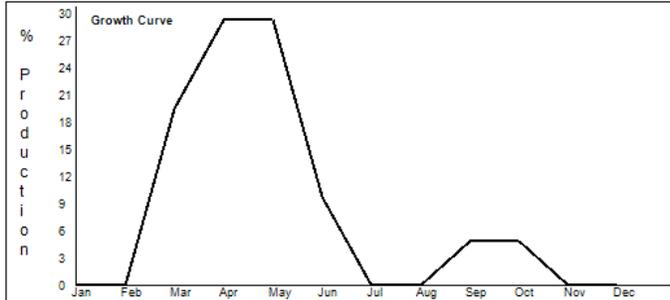
Fire removes big sagebrush, perennial bunchgrasses quickly recover and dominate. The natural fire return interval is highly variable depending on fuel levels and climate, but is expected to range between 10-70 years (Howard, 1999) in areas dominated by Wyoming big sagebrush.

Plant Growth Curve

Growth curve number: CO0102
 Growth curve name: MLRA 34B & 36 - Semidesert Sites
 Growth curve description: MLRA 34B and 36

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	20	30	30	10	0	0	5	5	0	0



Transition T1A

Invasive species are present on the site. The current potential state is less resilient than the reference state due to the presence of non-native/invasive species in the plant community.

Transition T1B

Continuous grazing of perennial species and lack of disturbance over a very long time span.

State 2: Current Potential State

The current potential state is similar in structure and function to the reference state, however invasive species are present in all community phases. The current potential state is generally dominated by big sagebrush and perennial grasses, but has an additional phase due to juniper encroachment as a result of fire suppression. The current potential state is less resilient than the reference state due to the presence of non-native/invasive species in the plant community.

Community Phase 2.1: Perennial Shrubland/Grassland

Perennial grasses co-dominate the site with big sagebrush and/or fourwing saltbush. Non-native species are present but not dominant.

Community Phase Pathway 2.1A

Fire removes big sagebrush, perennial bunchgrasses quickly recover and dominate. The natural fire return interval is highly variable depending on fuel levels and climate, but is expected to range between 10-70 years (Howard, 1999) in areas dominated by Wyoming big sagebrush.

Community Phase Pathway 2.1B

Low intensity fire, pathogens, or extended drought thin big sagebrush (Winward, 2004). The natural fire return interval is widely variable depending on fuel levels and climate, and is expected to be between 10-70 years in Wyoming big sagebrush communities (Howard, 1999). Perennial grasses and fourwing saltbush re-sprout, and the grasses dominate the site.

Community Phase Pathway 2.1C

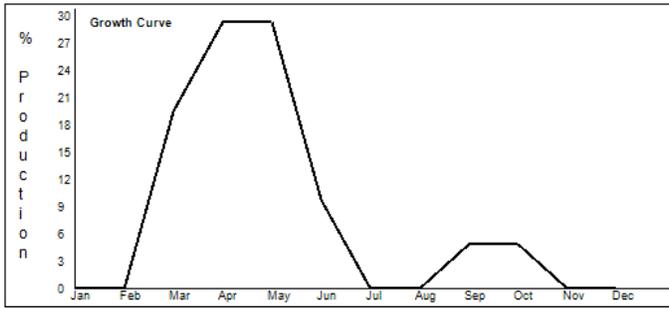
Extended time without disturbance, most commonly fire return intervals greater than about 70 years, promote pinyon and juniper establishment and growth in the community.

Plant Growth Curve

Growth curve number: CO0102
 Growth curve name: MLRA 34B & 36 - Semidesert Sites
 Growth curve description: MLRA 34B and 36

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	20	30	30	10	0	0	5	5	0	0



Community Phase 2.2: Perennial Grassland

This phase is dominated by perennial native grasses. Non-native species are present but not dominant.

Community Phase Pathway 2.2A

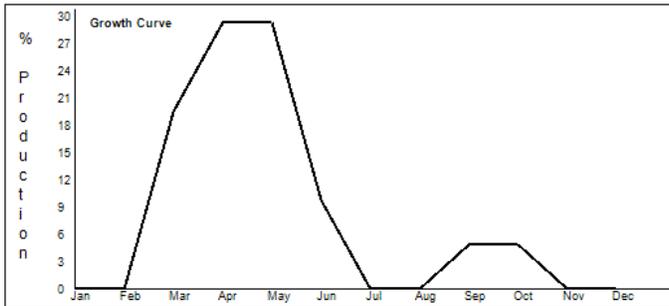
Time without disturbance can result in a natural increase in sagebrush dominance (Welch and Criddle, 2003). Grazing of perennial grasses may decrease the time required for this pathway.

Plant Growth Curve

Growth curve number: CO0102
 Growth curve name: MLRA 34B & 36 - Semidesert Sites
 Growth curve description: MLRA 34B and 36

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	20	30	30	10	0	0	5	5	0	0



Community Phase 2.3: Perennial Shrubland

Wyoming big sagebrush is the dominant plant in the perennial shrubland phase. James' galleta and Indian Ricegrass dominate the understory, along with a variety of other native perennial grasses. Forbs are a minor component of the plant community. Fourwing saltbush is often present. Non-native species are present but not dominant.

Community Phase Pathway 2.3A

Time without disturbance can result in a natural increase in sagebrush dominance (Welch and Criddle, 2003). Grazing of perennial grasses may decrease the time required for this pathway.

Community Phase Pathway 2.3B

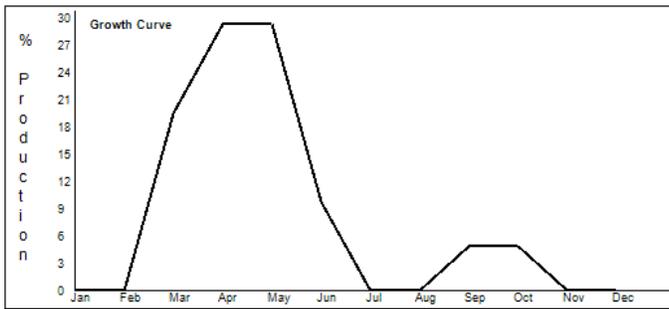
Fire removes big sagebrush, perennial bunchgrasses quickly recover and dominate. The natural fire return interval is highly variable depending on fuel levels and climate, but is expected to range between 10-70 years (Howard, 1999) in areas dominated by Wyoming big sagebrush.

Plant Growth Curve

Growth curve number: CO0102
 Growth curve name: MLRA 34B & 36 - Semidesert Sites
 Growth curve description: MLRA 34B and 36

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	20	30	30	10	0	0	5	5	0	0



Community Phase 2.4: PJ Encroached Shrubland

This phase is dominated by Wyoming big sagebrush. Pinyon and/or Utah juniper may dominate in patches, and many young trees are scattered throughout the sagebrush-dominated areas. Perennial grasses noticeably decrease, especially in areas where pinyon and juniper dominate. This reduces the resilience of the site by improving the germination site availability for non-native invasive species, especially following a burn.

Community Phase Pathway 2.4A

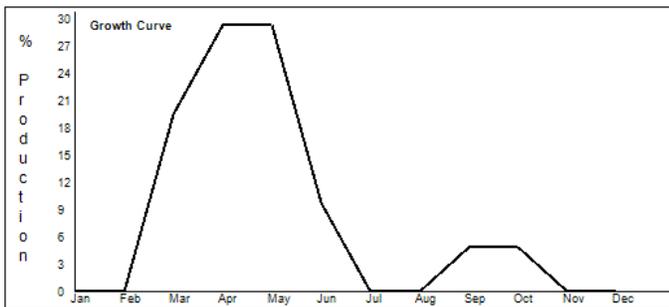
Fire removes big sagebrush, pinyon and juniper. Perennial grasses resprout quickly and dominate the site, except in patches where they were eliminated by pinyon and juniper dominance. These patches may be more susceptible to invasion by non-native/invasive species.

Plant Growth Curve

Growth curve number: CO0102
 Growth curve name: MLRA 34B & 36 - Semidesert Sites
 Growth curve description: MLRA 34B and 36

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	20	30	30	10	0	0	5	5	0	0



Transition T2A

Continuous grazing of perennial species and lack of disturbance over a very long time span.

Transition T2B

This transition is from big sagebrush dominated state, to a state that is dominated by invasive species. Events include establishment of invasive species, fire (<5-20 years), continuous season long grazing of perennial grasses, long term drought.

State 3: Depauperate State

This state occurs when native perennial grasses are removed by excessive grazing. Native forbs are also reduced. The fire return interval is greatly increased due to a lack of fine fuels. The prolonged fire return interval facilitates establishment of Utah juniper.

Community Phase 3.1: Depauperate Shrubland



Phase 3.1

This community phase is the result of excessive grazing or other disturbance that removes perennial grasses and native forbs from the understory. Wyoming big sagebrush dominates and overall production is greatly reduced.

Community Phase Pathway 3.1A

Prolonged time without fire or other brush-controlling disturbance promotes establishment and dominance of Utah juniper in patches.

Depauperate Shrubland Plant Species Composition

Grass/Grasslike					<u>Annual Production</u> (pounds per acre)		<u>Foliar cover</u> (percent)	
<u>Group</u>	<u>Group name</u>	<u>Common name</u>	<u>Symbol</u>	<u>Scientific name</u>	<u>Low</u>	<u>High</u>	<u>Low</u>	<u>High</u>
1		Grass, perennial	2GP		0	30		
					0	30		
Forb					<u>Annual Production</u> (pounds per acre)		<u>Foliar cover</u> (percent)	
<u>Group</u>	<u>Group name</u>	<u>Common name</u>	<u>Symbol</u>	<u>Scientific name</u>	<u>Low</u>	<u>High</u>	<u>Low</u>	<u>High</u>
2		Forb, annual	2FA		0	10		
		Forb, perennial	2FP		0	5		
					0	5		
Shrub/Vine					<u>Annual Production</u> (pounds per acre)		<u>Foliar cover</u> (percent)	
<u>Group</u>	<u>Group name</u>	<u>Common name</u>	<u>Symbol</u>	<u>Scientific name</u>	<u>Low</u>	<u>High</u>	<u>Low</u>	<u>High</u>
3		Shrub (>.5m)	2SHRUB		250	450		
		Wyoming big sagebrush	ARTRW8	Artemisia tridentata subsp. wyomingensis	0	40		
		shadscale saltbush	ATCO	Atriplex confertifolia	150	350		
		Cutler's jointfir	EPCU	Ephedra cutleri	0	35		
		broom snakeweed	GUSA2	Gutierrezia sarothrae	0	25		
		plains pricklypear	OPPO	Opuntia polyacantha	10	50		
		greasewood	SAVE4	Sarcobatus vermiculatus	0	15		
					0	10		
Tree					<u>Annual Production</u> (pounds per acre)		<u>Foliar cover</u> (percent)	
<u>Group</u>	<u>Group name</u>	<u>Common name</u>	<u>Symbol</u>	<u>Scientific name</u>	<u>Low</u>	<u>High</u>	<u>Low</u>	<u>High</u>
4		Utah juniper	JUOS	Juniperus osteosperma	0	15		
		twoneedle pinyon	PIED	Pinus edulis	0	15		
					0	5		

Annual Production by Plant Type

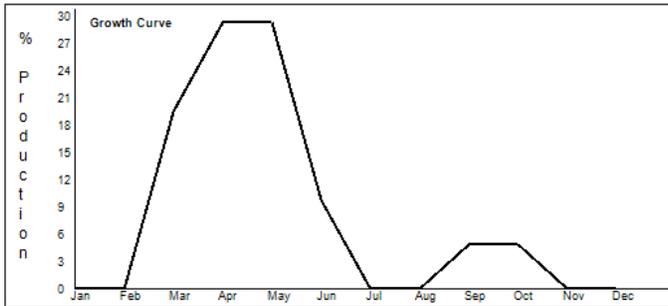
<u>Plant type</u>	<u>Low</u>	<u>Annual Production (lbs/ac)</u>	
		<u>Representative value</u>	<u>High</u>
Grass/Grasslike	0	15	25
Forb	0	5	10
Shrub/Vine	250	350	450
Tree	0	5	15
Total	250	375	500

Plant Growth Curve

Growth curve number: CO0102
 Growth curve name: MLRA 34B & 36 - Semidesert Sites
 Growth curve description: MLRA 34B and 36

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	20	30	30	10	0	0	5	5	0	0



Community Phase 3.2: Depauperate Encroached Shrubland

This community phase occurs when Utah juniper begins to dominate the site in patches due to prolonged time without fire or other shrub-controlling disturbance.

Community Phase Pathway 3.2A

Brush management can thin Utah juniper and return the site to phase 3.1.

Transition T3A

This transition is expected to occur when fire or other juniper-controlling disturbance has been absent from the site for at least 150 years. Sagebrush becomes very decadent and Utah juniper outcompetes all species for water and other resources.

Restoration Pathway R3A

Brush management and seeding to adapted perennial grasses, forbs and shrubs under favorable climatic conditions may result in a restoration of state 2 from the depauperate state 3.

State 4: Juniper Encroachment

This state occurs due to lack of fire or other brush controlling disturbance. Utah juniper performs well on this ecological site in the absence of disturbance, and eventually outcompetes Wyoming big sagebrush for water and nutrients. The result is a juniper dominated state with little to no Wyoming big sagebrush, perennial grasses, or forbs in the understory.

Community Phase 4.1: Juniper Encroachment

This is the only phase in the fire-resistant, self-perpetuating state dominated by Utah juniper.

Transition T4A

This transition is from big sagebrush dominated state, to a state that is dominated by invasive species. Events include establishment of invasive species, fire (<5-20 years), continuous season long grazing of perennial grasses, long term drought.

Transition T4B

Seeding of introduced/native species (grasses and forbs) is the pathway to state 4. Also, trees are usually removed by mechanical or chemical treatments. This transition requires energy input into the system.

Restoration Pathway R4A

Pathways can be one or more of the following: brush treatments, seeding, insect herbivory/pathogen, proper grazing, drought, and/or fire. This pathway requires lots of energy input into the system.

State 5: Invasive Annual State

This state is dominated by invasive annual species. Invasive annual species can include cheatgrass, Russian thistle, kochia, halogeton, storks-bill geranium, and annual mustards. Generally as ecological conditions deteriorate and perennial vegetation decreases due to disturbance (fire, over grazing, drought, off road vehicle overuse, erosion, etc.) annual forbs and grasses will invade the site. The presence of these species will depend on soil properties and moisture availability; however, these invaders are highly adaptive and can flourish in many locations. Once established, complete removal is difficult but suppression may be possible.

Community Phase 5.1: Sagebrush with Annuals

This state will look big sagebrush with an invasive annual species understory. Frequently, sagebrush canopy cover will be dense due to little to none perennial understory being present. Cheatgrass, and other annual introduced species are now present in the understory. It can function as a plant community this way unless the fire return interval decreases to less than 5 years (Whisenant 1986). Then it will transition to an Annual grasses phase (5.2). This phase is at risk for becoming a cheatgrass-dominated grassland.

Community Phase Pathway 5.1A

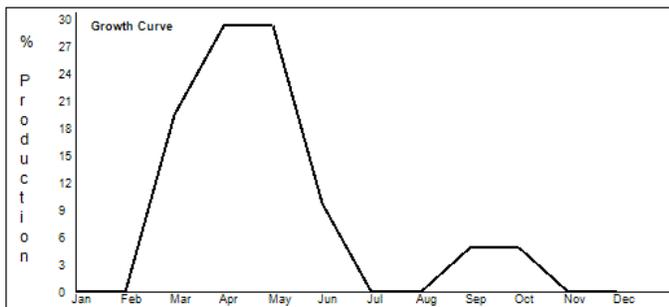
This pathway occurs when frequent fire or drought remove the big sagebrush, and favor the establishment of cheatgrass or other invasive annuals. In a degraded sagebrush community, cheatgrass will take advantage of the increased interspaces between plants will typically establish in the interspaces. Once annuals get established it creates a fine fuel load which will decrease the fire return interval. With more frequent fires, sagebrush can be eliminated from the site and a monocultures of invasive annuals can become established. These monocultures can persist for long time periods. Frequent fires also prevent the re-establishment of sagebrush on the site.

Plant Growth Curve

Growth curve number: CO0102
 Growth curve name: MLRA 34B & 36 - Semidesert Sites
 Growth curve description: MLRA 34B and 36

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	20	30	30	10	0	0	5	5	0	0



Community Phase 5.2: Annual Monoculture

This community is characterized by an almost a complete monoculture of cheatgrass and/or other invasive annuals. This community can be long-lasting phase if fires and disturbance continue to be frequent.

Community Phase Pathway 5.2A

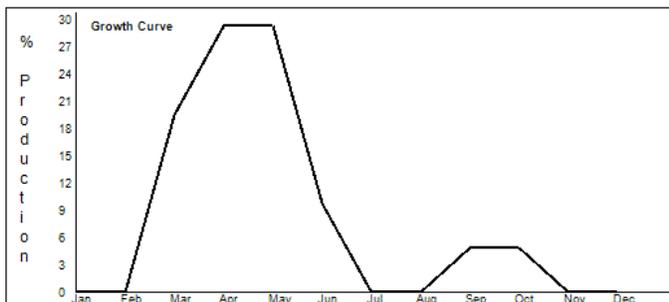
This pathway occurs when there is a longer fire return interval. Longer fire return intervals can be enabled by using fire suppression and fire breaks to allow perennial vegetation to a change to get established. Along with this seeding and/or proper grazing may allow native perennial plants to return to this community. This pathway has very intensive energy inputs.

Plant Growth Curve

Growth curve number: CO0102
 Growth curve name: MLRA 34B & 36 - Semidesert Sites
 Growth curve description: MLRA 34B and 36

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	20	30	30	10	0	0	5	5	0	0



Transition T5A

This transition requires fire return intervals to length and fire suppression may be necessary to interrupted the shorten fire return intervals that occur when cheatgrass and other annuals invade. Juniper will encroach onto the site with time and lack of fire. Seeding may be necessary to establish perennial plants. This could require significant energy inputs to make this transition happen.

Restoration Pathway R5A

Invasive annuals will need to be treated and dominance suppress enough to allow desired seeded species the ability to complete so that they can become established. Seeding of introduced species is the pathway to state 4. This transition will be difficult and require substantial inputs and management of the site. It may not be practical on a large scale. Research is needed for species adapted to compete with annual invasive plants, and seeding techniques to add with successful transition from the invasive annual state.

State 6: Seeded State

This state results from seeding introduced perennial grasses (i.e. crested wheatgrass and Russian wildrye). Native perennial grasses, forbs and shrubs may be included in the seed mix. This state behave similar community dynamics to the current potential state community. Other vegetation treatments may be necessary to get to this state, they include chaining, mowing, disking, prescribed burning and other techniques which manipulate the plant community. Applying vegetation treatments to plant communities to either the invasive annuals or juniper encroachment states to create a seeded state is often the first step in assisted restoration to plant communities an intermediate step to get to the Current Potential State. The seeded state could persist for long periods of time with proper management. Native grasses and forbs may reestablish over time from nearby seed sources. Big sagebrush will typically reestablish in 30-40 years.

Community Phase 6.1: Seeded Grassland

This community is dominated by seeded plants such as crested wheatgrass, Russian wildrye, smooth brome, and intermediate and pubescent wheatgrasses. Big sagebrush has little to no production in this phase. This site has high production due to the seed grass production. This production typically is higher than the current potential or reference state. This site usually has low species diversity.

Community Phase Pathway 6.1A

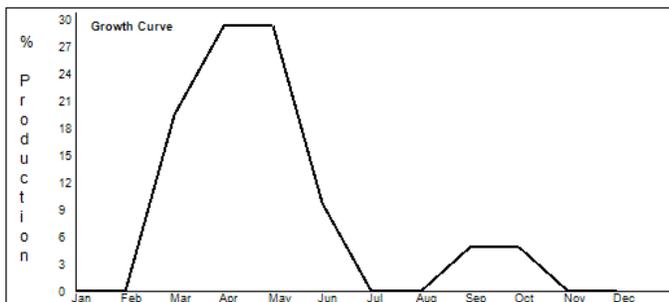
Time without disturbance and climatic conditions that favor establishment of sagebrush will assist this pathway. Improper grazing on the grasses species can favor shrub establishment and reduce their competitiveness. Also, several consecutive years of droughts can reduce grass cover.

Plant Growth Curve

Growth curve number: CO0102
 Growth curve name: MLRA 34B & 36 - Semidesert Sites
 Growth curve description: MLRA 34B and 36

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	20	30	30	10	0	0	5	5	0	0



Community Phase 6.2: Seeded Grassland/Shrubland

This phase has big sagebrush co-dominant with the seeded grass.

Community Phase Pathway 6.2A

This transition is caused by naturally occurring fires, herbivory of sagebrush, and/or drought that suppresses sagebrush establishment. These events tend to favor grass establishment. With a mature sagebrush community, this pathway can be caused by high intensity fire that burns hot enough to remove big sagebrush and PJ, if it has started to encroach. Low-intensity fire after sagebrush has had a chance to set seed, improper grazing and or browsing by native ungulates, and possible stem-root pathogens will revert a young sagebrush community to a grassland with the potential to become a sagebrush-grass community once again (Winward, 2004). Vegetation treatments (mechanically, prescribed fire, chemically, etc.) can also be employed to imitate the natural disturbances regime.

Community Phase Pathway 6.2B

This pathway favors shrub establishment. This pathway is cause by time without disturbance (i.e. fire) and favorable conditions for young

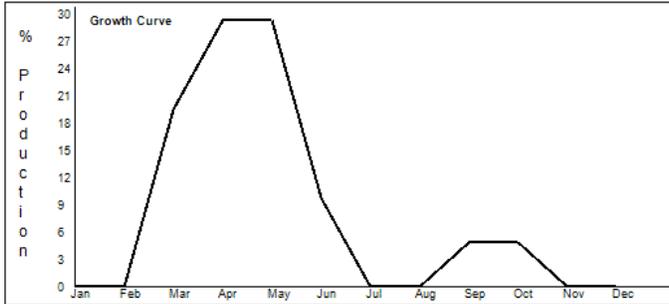
sagebrush establishment. Also, Pinyon and juniper will start to encroach under these condition. Improper continuous grazing of perennial grasses will speed up this pathway. This will lead to an old decadent stand of sagebrush with little to no understory.

Plant Growth Curve

Growth curve number: CO0102
Growth curve name: MLRA 34B & 36 - Semidesert Sites
Growth curve description: MLRA 34B and 36

Percent Production by Month

<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>
0	0	20	30	30	10	0	0	5	5	0	0



Community Phase 6.3: Seeded Shrubland

This community consists big sagebrush with sparse understory. Sagebrush canopy cover would typically be greater than 35%. Scattered Utah juniper and maybe two-needle pinyon might have encroached. Two-needle pinyon and Utah juniper are natural invaders if stands are found adjacent to this site. Trees left uncontrolled can form dense stands and eventually dominate the site. Nonnative invasive species, such as cheatgrass are present but in insignificant amounts. Biological crusts are typically well developed in the interspaces; however, bare ground is most common in this community phase.

Community Phase Pathway 6.3A

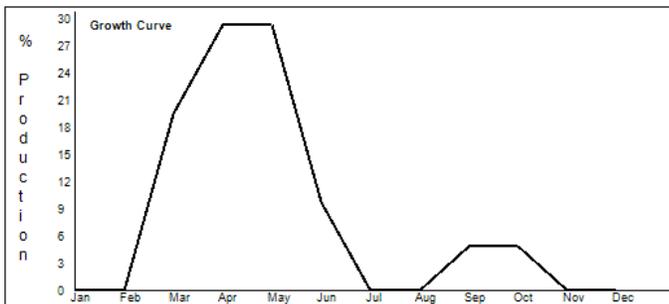
This pathway is caused by naturally occurring fires, vegetation treatments (chemical and mechanical), and/or insect herbivory removes the shrubs and possible trees if they have encroached on this site. It reverts the system back to a grassland phase. Depending on the amount of understory present, grasses and forbs may need to be reseeded to aid reestablishment.

Plant Growth Curve

Growth curve number: CO0102
Growth curve name: MLRA 34B & 36 - Semidesert Sites
Growth curve description: MLRA 34B and 36

Percent Production by Month

<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>
0	0	20	30	30	10	0	0	5	5	0	0



Transition T6A

This transition is from a seeded state, to a state that is dominated by invasive species. Events include increased of invasive species, shortened fire return interval, and long term drought. Improper continuous season long grazing of perennial grasses can reduce the time needed for this pathway.

Transition T6B

This transition is from the big sagebrush-seeded grass state to a state that is dominated by two-needle pinyon and Utah juniper. Events include, fire suppression, time without disturbance, insect herbivory, continuous season long grazing of perennial grasses, and tree invasion.

As canopy density increase, bare ground will increase further increasing the fire return interval, accelerating erosion, increasing run-off and further affecting the watershed functionality. This transition also favors the establishment of invasive annual species such as cheatgrass.

Restoration Pathway R6A

This return path could possible occur as a result of long time frames without disturbance. Native plants from adjacent site would slow establish in the seeded state. Proper grazing from livestock and wildlife which would favor the establishment of native plants. Removal of the Utah juniper and Pinyon as they encroach would also be necessary.

Section II: Ecological Site Interpretations

Animal Community

This section is from the 1988 Range site:

--General wildlife--

This site provides both food and cover for wildlife. There is palatable browse for mule deer and pronghorn, and when present, grasses such as muttongrass and Indian rice grass offer good grazing. When this site occurs near water, the species richness and the abundance of large mammals is increased. Birds, Bats, lizards, snakes and rodents are more common when this site occurs far from water.

--Grazing Interpretations--

This site provides good year round grazing conditions for livestock and wildlife due to the high availability of nutritious forage. Yet, this site often lacks natural perennial water sources, which can influence the suitability for livestock and wildlife grazing. The suitability for re-seeding or restoring this site is fair due to the extreme temperatures and variability in time and amount of precipitation. This site may occur in desert bighorn sheep, elk, mule deer and pronghorn antelope ranges, and are important wintering areas for these wildlife species. However, in many places the populations will be small and have little grazing impact on the site.

The grasses present provide good grazing conditions for horses, cattle, sheep, elk, and bighorn sheep. The presence of shrubs, primarily Wyoming big sagebrush, fourwing saltbush, winterfat, and rabbitbrush provide year round browse for all classes of livestock and wildlife. Wyoming sagebrush and winterfat provides good wintering browse due to its high protein content; however sagebrush is used sparingly by livestock when other herbaceous forages are available. Forb composition and annual production depends primarily on precipitation amounts and thus is challenging to use in livestock grazing management decisions. However, forb composition should be monitored for species diversity, as well as poisonous or injurious plant communities which may be detrimental to livestock if grazed. Before making specific grazing management recommendations, an onsite evaluation should be made.

The approximate vegetative basal density is 10 to 15 percent.

Vegetation density = basal area, which is the area of ground surface covered by the stem or stems. Usually, this is measured one inch above the soil in contrast to the full spread of foliage

Guide to Initial Stocking Rates:

Stocking rates are based on an average growing season. Based on 1200 pounds 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 7.9 pounds per day under normal conditions).

Excellent

AUM/ac = .17 - .15

ac/AUM = 5.7 - 7.1

Good

AUM/ac = .14 - .09

ac/AUM = 7.1 - 12.5

Fair

AUM/ac = .08 - .05

ac/AUM = 12.5 - 25.0

Poor

AUM/ac = .04 - .00

ac/AUM = 25.0 - 50.0

--Major Poisonous Plants to Livestock: --

Silvery lupine (*Lupinus argenteus*) - dangerous when other forage is scarce and if hay contains immature lupine pods. All livestock are occasionally poisoned. Sheep are the most affected.

Effects Upon Animals:

Lupine seeds are toxic to sheep when 0.25 to 1.5 percent of the animal's body weight is consumed in one feeding. The toxin is not cumulative and small amounts ingested over a period of time create no difficulties. Most characteristic symptom is labored breathing. Animals may vary from depression and coma to extreme activity. Animals may butt objects and other animals or may stand with lowered head pressing against a solid object. Death from respiratory paralysis follows a short period of convulsions.

Broom snakeweed (*Xanthocephalum sarothrae*)-dangerous when forage is scarce. Cattle and sheep are the most affected.

Effects Upon Animals:

Poisoning is not common but will occur on overgrazed ranges. Causes abortion in cattle or may produce weak underweight calves. Losses

sego lily	Calochortus nuttallii	Entire plant	D	D	D	D	D	D	D	D	D	D	D	D
yellow rabbitbrush	Chrysothamnus viscidiflorus	Entire plant	U	U	U	U	U	U	U	U	U	U	U	U
squirreltail	Elymus elymoides subsp. elymoides	Entire plant	D	D	D	D	D	D	D	D	D	D	D	D
mormon tea	Ephedra viridis	Entire plant	U	U	U	U	U	U	U	U	U	U	U	U
trailing fleabane	Erigeron flagellaris	Entire plant	U	U	U	U	U	U	U	U	U	U	U	U
broom snakeweed	Gutierrezia sarothrae	Entire plant	U	U	U	U	U	U	U	U	U	U	U	U
winterfat	Krascheninnikovia lanata	Entire plant	P	P	P	P	P	P	P	P	P	P	P	P
silvery lupine	Lupinus argenteus	Entire plant	U	U	U	U	U	U	U	U	U	U	U	U
plains pricklypear	Opuntia polyacantha	Entire plant	U	U	U	U	U	U	U	U	U	U	U	U
New Mexico groundsel	Packera neomexicana var. mutabilis	Entire plant	U	U	U	U	U	U	U	U	U	U	U	U
western wheatgrass	Pascopyrum smithii	Entire plant	P	P	P	P	P	P	P	P	P	P	P	P
toadflax penstemon	Penstemon linarioides	Entire plant	U	U	U	U	U	U	U	U	U	U	U	U
beardtongue	Penstemon	Entire plant	U	U	U	U	U	U	U	U	U	U	U	U
James' galleta	Pleuraphis jamesii	Entire plant	P	P	P	P	P	P	P	P	P	P	P	P
scarlet globemallow	Sphaeralcea coccinea	Entire plant	D	D	D	D	D	D	D	D	D	D	D	D
sand dropseed	Sporobolus cryptandrus	Entire plant	D	D	D	D	D	D	D	D	D	D	D	D

Animal kind: Adult sheep

<u>Common name</u>	<u>Scientific name</u>	<u>Plant part</u>	<u>J</u>	<u>F</u>	<u>M</u>	<u>A</u>	<u>M</u>	<u>J</u>	<u>J</u>	<u>A</u>	<u>S</u>	<u>O</u>	<u>N</u>	<u>D</u>
Indian ricegrass	Achnatherum hymenoides	Entire plant	P	P	P	P	P	P	P	P	P	P	P	P
Fendler threeawn	Aristida purpurea var. longiseta	Entire plant	U	U	U	U	U	U	U	U	U	U	U	U
Wyoming big sagebrush	Artemisia tridentata subsp. wyomingensis	Entire plant	P	P	P	P	P	P	P	P	P	P	P	P
freckled milkvetch	Astragalus lentiginosus	Entire plant	U	U	U	U	U	U	U	U	U	U	U	U
fourwing saltbush	Atriplex canescens	Entire plant	P	P	P	P	P	P	P	P	P	P	P	P
blue grama	Bouteloua gracilis	Entire plant	P	P	P	P	P	P	P	P	P	P	P	P
sego lily	Calochortus nuttallii	Entire plant	P	P	P	P	P	P	P	P	P	P	P	P
yellow rabbitbrush	Chrysothamnus viscidiflorus	Entire plant	D	D	D	D	D	D	D	D	D	D	D	D
squirreltail	Elymus elymoides subsp. elymoides	Entire plant	D	D	D	D	D	D	D	D	D	D	D	D
mormon tea	Ephedra viridis	Entire plant	U	U	U	U	U	U	U	U	U	U	U	U
trailing fleabane	Erigeron flagellaris	Entire plant	D	D	D	D	D	D	D	D	D	D	D	D
broom snakeweed	Gutierrezia sarothrae	Entire plant	U	U	U	U	U	U	U	U	U	U	U	U
winterfat	Krascheninnikovia lanata	Entire plant	P	P	P	P	P	P	P	P	P	P	P	P
silvery lupine	Lupinus argenteus	Entire plant	D	D	D	D	D	D	D	D	D	D	D	D
plains pricklypear	Opuntia polyacantha	Entire plant	U	U	U	U	U	U	U	U	U	U	U	U
New Mexico groundsel	Packera neomexicana var. mutabilis	Entire plant	D	D	D	D	D	D	D	D	D	D	D	D
western wheatgrass	Pascopyrum smithii	Entire plant	D	D	D	D	D	D	D	D	D	D	D	D
toadflax penstemon	Penstemon linarioides	Entire plant	D	D	D	D	D	D	D	D	D	D	D	D
beardtongue	Penstemon	Entire plant	D	D	D	D	D	D	D	D	D	D	D	D
James' galleta	Pleuraphis jamesii	Entire plant	D	D	D	D	D	D	D	D	D	D	D	D
scarlet globemallow	Sphaeralcea coccinea	Entire plant	D	D	D	D	D	D	D	D	D	D	D	D
sand dropseed	Sporobolus cryptandrus	Entire plant	D	D	D	D	D	D	D	D	D	D	D	D

Legend: P=Preferred; D=Desirable; U=Undesirable; N=Not consumed; E=Emergency; T=Toxic; X=Used, but degree of utilization unknown

Hydrology 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

Fine-Loamy Moderately Deep Soils (depth 20 to 40 Inches)

Hagerman C
Gapmesa B & C
Progresso B

Fine-Loamy Deep Soils (soils greater than 40 inches)

Barx B & C
Blancot B
Abra B

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 1988 Range site:

This site has fair to poor aesthetic appeal and natural beauty. During exceptional rainfall years, a profusion of flowering plants appear.

Wood Products

None

Other Information

Plant Preference table is from 1988 range site.

Supporting Information

Associated Sites

<u>Site name</u>	<u>Site ID</u>	<u>Site narrative</u>
Stony Salt Desert	R034BY404CO	Stony Salt Desert is found on gentle sloping (0-15%) benches and mesas. Soils are deep and have a loam surface. Subsoil is a loam to clay loam. There are basalt cobbles and gravels on the surface and occasionally in the profile. Dominant vegetation is shadscale, galleta, squirreltail, Indian ricegrass, globemallow and winterfat. Clayey salt desert is shallow in depth with heavy silty clay loams, silty clay and clay textures with salts and calcareous to the surface.
Foothill Juniper	F034BY447CO	Foothill Juniper is a gentle sloped (<25-30% slope) site with very shallow to shallow soils that are loamy in texture. This site is dominated by Utah Juniper and scattered pinyon. This site may have Wyoming big sagebrush in the understory. Foothill Juniper has higher precipitation than Semidesert Loam. The temperature is slightly cooler than the semidesert site. Foothill site will be found at elevations above the semidesert site. The soils are similar in nature.
Alkali Bottom	R035XY413CO	Alkali Bottom is found on terraces, drainage-ways and alluvial valley floors. This site is in a run-in position on the landscape. Soils are deep from shale and sandstone. Soils are moderate to strongly alkaline. Surface textures are sandy loam, clay loam or silty clay loam. Subsurface textures are silty clay loam. Dominant plants are alkali sacaton, inland saltgrass, basin wildrye, and greasewood.

Shallow Clay Loam - (Pinyon-Juniper)	R036XY110CO	Shallow Clay Loam Pinyon-Juniper is a gentle sloped (<25-30% slope) site with shallow soils that are clayey in texture. This site is dominated by Utah Juniper and scattered pinyon. This site may have Wyoming big sagebrush in the understory.
Steep Shallow Clay Loam - (Pinyon-Juniper)	R036XY111CO	Steep Shallow Clay Loam Pinyon-Juniper is a very steep sloped site with shallow soils that are clayey in texture. This site is dominated by Utah Juniper and scattered pinyon. This site may have Wyoming big sagebrush in the understory.
Semidesert Juniper Loam	R036XY113CO	Semidesert Juniper Loam is a gentle sloped (<25-30% slope) site with shallow soils that are loamy in texture. This site is dominated by Utah Juniper and scattered pinyon. This site may have Wyoming big sagebrush in the understory.
Semidesert Sandy Loam	R036XY326CO	Semidesert Sandy Loam is on coarse texture soils. Clay content is lower in these soils than those found in Semidesert Loam. Both are a Wyoming big sagebrush dominated site. Needle-and-thread is the dominant grass on this site. The soils on this site are moderately deep to very deep.
Semidesert Clay Loam	R036XY328CO	Semidesert Clay Loam is on clayey texture soils. Clay content is higher in these soils than those found in Semidesert Loam. Both are a Wyoming big sagebrush dominated site. Western wheatgrass/thickspike wheatgrass is the dominant grass on this site. The soils on this site are moderately deep to very deep.
Loamy Bottom	R036XY405CO	Loamy bottom occurs on drainage-ways, floodplains and alluvial fans. This site is in a run-in position on the landscape. Soils are deep. Soil textures are generally loams. Dominant vegetation is basin wildrye, muttongrass, basin big sagebrush, and western wheatgrass.
Steep Colluvial Slopes	R036XY445CO	Steep Colluvial Slopes is a very steep (>25% slope) sloped site with very shallow to shallow soils that are clayey in texture. This site is dominated by Utah Juniper and pinyon. This site may have Wyoming big sagebrush in the understory. This site has higher precipitation than Semidesert Loam. The temperature is slightly cooler than the semidesert site. Foothill site will be found at elevations above the semidesert site. The soils are similar in nature.

Similar Sites

<u>Site name</u>	<u>Site ID</u>	<u>Site narrative</u>
Loamy Foothills	R036XY284CO	Loamy Foothills has higher precipitation than Semidesert Loam. The temperature is slightly cooler than the semidesert site. Foothill site will be found at elevations above the semidesert site. The soils are similar in nature.
Semidesert Sandy Loam	R036XY326CO	Semidesert Sandy Loam is on coarse texture soils. Clay content is lower in these soils than those found in Semidesert Loam. Both are a Wyoming big sagebrush dominated site. Needle-and-thread is the dominant grass on this site. The soils on this site are moderately deep to very deep.
Semidesert Clay Loam	R036XY328CO	Semidesert Clay Loam is on clayey texture soils. Clay content is higher in these soils than those found in Semidesert Loam. Both are a Wyoming big sagebrush dominated site. Western wheatgrass/thickspike wheatgrass is the dominant grass on this site. The soils on this site are moderately deep to very deep.

State Correlation

This site has been correlated with the following states: CO NM UT

Inventory Data References by Plot (Range-417, Wood-4, Wood-5)

<u>Data source</u>	<u>Sample ID</u>		<u>State</u>	<u>County</u>	<u>State</u>	<u>County</u>
	<u>Number</u>	<u>Year</u>	<u>code</u>	<u>code</u>		
R-417	1258208045	1982	08	045	Colorado	Garfield
	1358208077	1982	08	077	Colorado	Mesa
	0017908085	1979	08	085	Colorado	Montrose

Other Inventory Data References

<u>Data source</u>	<u>Number of records</u>	<u>Sample period</u>	<u>State</u>	<u>County</u>
417	1	2009	Colorado	Montezuma
Gap Intercept	1	2009	Colorado	Montezuma
Line Pt. with Ht.	1	2009	Colorado	Montezuma
Ut-2s	3	2009	Colorado	Montezuma
NRI Plots	6	2003-2006	Colorado	Montrose
Ut-2s	2	2009	Colorado	San Juan
417	2	2009	Utah	San Juan

Gap Intercept	2	2009	Utah	San Juan
Line Pt. with Ht.	2	2009	Utah	San Juan

Type Locality

State: CO
County: Montrose
Township: 47N
Range: 18W
Section: 12
General legal description: Highway 90, 3 miles east of Bedrock Store, Paradox Valley

Hierarchical 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:

341Ba - Mancos Shale Lowlands-Grand Valley, 341Bd - Salt Anticline Benchlands, 341Bg - Northeast Flank, 341Bo - North Uncompahgre Plateau, 341Bp - Uncompahgre Plateau, and 341Bq - South Uncompahgre Plateau subsections <341B Northern Canyonlands Section < 341 Intermountain Semi-desert and Desert (Cleland, et al., 2007).

313Aa - San Juan Basin-Mesa Verde, 313Ab - Canyon of Ancients-Blanding Basin, and 313Ac - Monument Upwarp subsections <313A Grand Canyons Section < 341 Colorado Plateau Semi-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).

EPA: 20a Monticello-Cortez Uplands, 20b Shale Deserts and Sedimentary Basins and 20c Semiarid Benchlands and Canyonlands, < 20 Colorado Plateau < 10.I Cold Deserts < 10 North American Deserts (Griffith, 2006).

USGS:

Colorado Plateau Province (Canyonlands and Navajo Section)

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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 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.

Site Authors

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Certifications

NRCS Science and Technology Certified by Rachel Murph (9/18/2017)

Quality Assurance

Provisional Status Verified by Scott Woodall (12/21/2017)

Reference Sheet

Certification: Reference Sheet Certified by Rachel Murph (9/18/2017)

Author(s)/participant(s): Original written by Steve Myers and Scott Woodall (12/15/2004). Revised by Jake Owens (2/12/2012). Owens used R035XY209UT reference sheet and revised it to match this site. The R035XY209UT reference sheet was prepared by V. Keith Wadman (NRCS Ret.), F.E. Busby (USU), Paul Curtis (BLM), Dana Truman (NRCS), Robert Stager (BLM), Shane A. Green (NRCS) Revised and updated by Suzanne Mayne-Kinney on 2/2/2017.

Contact for lead author:

Date: 2/2/2017 **MLRA:** 036X **Ecological Site:** Semidesert Loam R036XY325CO This *must* be verified based on soils and climate (see Ecological Site Description). Current plant community cannot be used to identify the ecological site.

Composition (indicators 10 and 12) based on: X Annual Production, Foliar Cover, Biomass

Indicators. For each indicator, describe the potential for the site. Where possible, (1) use numbers, (2) include expected range of values for above- and below-average years for **each** community and natural disturbance regimes within the reference state, when appropriate and (3) cite data. Continue descriptions on separate sheet.

1.

Number and extent of rills: None to few. Any rills present should be somewhat short in length (less than 6 feet long) and are very shallow which follow the surface micro-features. An increase in rill formation may be seen after disturbance events such as recent fire or thunderstorms in adjacent landscape settings where increased runoff may accumulate (such as areas below exposed bedrock). Such rill development should usually be limited to slopes exceeding 20%.

- 2. Presence of water flow patterns:** Flow patterns wind around perennial plant bases and show little to slight evidence of erosion. They are short, stable and usually disconnected. There is minor evidence of deposition. On gently sloping (< 10 % slopes) locations within the site, water flow patterns are infrequent and usually less than 3 feet. Longer water flow patterns may be found on steeper slopes (> 20 %). Numerous small debris dams may be obvious after rainfall events.
-

- 3. Number and height of erosional pedestals or terracettes:** Plants should show little or no pedestalling. Terracettes should be absent or few. Pedestals that occur may be found on steeper slopes (> 20 %) and usually associated with water flow patterns. Loss of plant cover can result in well-developed biological soil crust forming. This interspaces between well-developed biological soil crusts may resemble pedestals but they are actually a characteristic of the crust formation.
-

- 4. Bare ground from Ecological Site Description or other studies (rock, litter, standing dead, lichen, moss, plant canopy are not bare ground):** 10–15% bare ground is common. Ground cover is based on the first raindrop impact, and bare ground is the opposite of ground cover. Well-developed biological soil crusts should not be recorded as bare ground. Poorly developed biological soil crusts that are interpreted as functioning as bare ground (therefore they would be susceptible to raindrop splash erosion) should be recorded as bare ground. Extended drought can cause bare ground to increase.
-

- 5. Number of gullies and erosion associated with gullies:** None to few. Some gullies may be present in landscape settings where increased runoff may accumulate (such as areas below exposed bedrock). Such gully development is expected to be limited to slopes exceeding 20% and adjacent to sites where runoff accumulation occurs. Any gullies present should show little sign of accelerated erosion and should be stabilized with perennial vegetation.
-

- 6. Extent of wind scoured, blowouts and/or depositional areas:** Very minor evidence of wind generated soil movement. Wind scoured (blowouts) and depositional areas are rarely present.
-

- 7. Amount of litter movement (describe size and distance expected to travel):** Most litter resides in place with some redistribution caused by water movement. Minor litter removal may occur in flow patterns and rills with deposition occurring at points of obstruction. The majority of litter accumulates at the base of plants. Some grass leaves and small twigs (grass stems) may accumulate in soil depressions adjacent to plants. Woody stems are not likely to move.
-

- 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 5 to 6 under vegetation canopies and a ratio of 2 to 4 in the interspaces. The average should be a 4. Vegetation cover, litter, biological soil crusts and surface rock reduce erosion.
-

- 9. Soil surface structure and SOM content (include type and strength of structure, and A-horizon color and thickness):** The surface layer is light brown to reddish brown fine sandy loams or loam, 2 to 10 inches thick. The A horizon is weakly developed, but the A horizon would be expected to be more strongly developed under plant canopies. It is important if you are sampling to observe the A horizon under plant canopies as well as the interspaces. Refer to soil survey for more detailed information about your specific site.
-

- 10. Effect on plant community composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Vascular plants and well developed biological soil crusts will break raindrop impact and splash erosion. Spatial distribution of vascular plants and interspaces between well-developed biological soil crusts (where present) provide detention storage and surface roughness that slows runoff allowing time for infiltration. Interspaces between plants and well developed biological soil crusts (where present) may serve as water flow patterns during episodic runoff events, with natural erosion expected in severe storms. When perennial grasses decrease, reducing ground cover and increasing bare ground, runoff is expected to increase and any associated infiltration reduced.
-

- 11. Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. Naturally occurring soil horizons may be harder than the surface because of an accumulation of clay (soil texture change) or calcium carbonate and should not be considered as compaction layers.
-

- 12. Functional/Structural Groups (list in order of descending dominance by above-ground weight using symbols: >>, >, = to indicate much greater than, greater than, and equal to) with dominants and sub-dominants and "others" on separate lines:**

Dominant: Perennial grasses (Indian ricegrass, Galleta) = non-sprouting shrubs (Wyoming big sagebrush) >

Sub-dominant: sprouting shrubs (Winterfat, Fourwing saltbush) = annual forbs

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.

- 13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** All age classes of perennial grasses should be present under average to above average growing conditions with age class expression likely subdued during below average years. Slight decadence in the principle shrubs could occur near the end of the fire cycle or during and following an extended drought. Expect more decadence on bunchgrasses with lack of disturbance. In general, a mix of age classes may be expected with some dead and decadent plants present.

- 14. Average percent litter cover (10-20%) and depth (.25-.5inches):** (10-20%). Variability may occur due to weather. Litter cover declines during and following a drought as the plants are not producing the litter.

- 15. Expected annual production (this is TOTAL above-ground production, not just forage production):** 400 lbs./ac, low precipitation years, 600 lbs./ac/ average precipitation years, 800 lbs./ac above average precipitation years. After extended drought or the first growing season following a wildfire, production may be significantly reduced by 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 indicator, we are describing what is NOT expected in the reference state for the ecological site:** Green rabbitbrush, Cheatgrass, Purple Threeawn, Broom snakeweed & introduced annual forbs (Filaree, Russian thistle, sticktight).

- 17. Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce sexually or asexually in most years. The only limitations are weather-related, wildfire, natural diseases and insects. Low green rabbitbrush sprouts vigorously following fire.

Reference Sheet Approval

Approval

Rachel Murph, State Rangeland Management Spec., USDA NRCS Colorado

Date

9/18/2017