

Ecological site R035XC328AZ  
Cobbly Slopes 10-14" p.z.

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General information

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

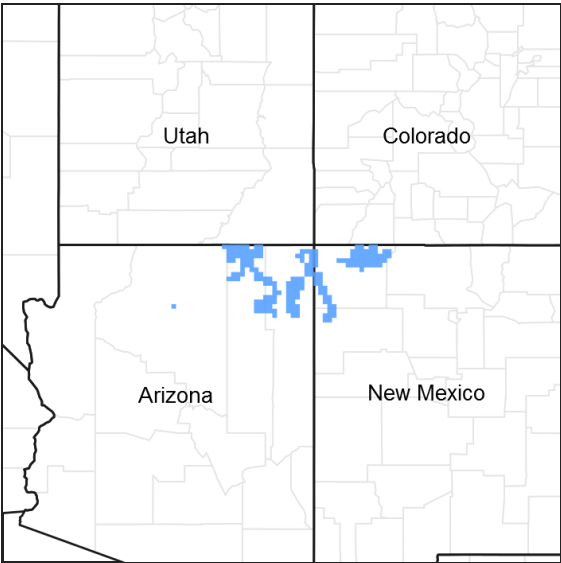


Figure 1. Mapped extent

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

MLRA notes

Major Land Resource Area (MLRA): 035X–Colorado Plateau

AZ CRA 35.3 – Colorado Plateau Sagebrush – Grasslands

Elevations range from 4800 to 6700 feet and precipitation averages 10 to 14 inches. Vegetation includes Wyoming big sagebrush, Utah juniper, Colorado pinyon - cliffrose, Mormon tea, fourwing saltbush, blackbrush Indian ricegrass, needle and thread, western wheatgrass Galleta, black grama, blue grama, and sand dropseed. The soil temperature regime is mesic and the soil moisture regime is ustic aridic. This unit occurs within the Colorado Plateau Physiographic Province and is characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys and deep canyons. Sedimentary rock classes dominate the plateau with volcanic fields occurring for the most part near its margin.

Table 1. Dominant plant species

Tree	(1) <i>Juniperus osteosperma</i>
Shrub	(1) <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> (2) <i>Gutierrezia sarothrae</i>
Herbaceous	(1) <i>Hesperostipa comata</i> ssp. <i>comata</i> (2) <i>Hesperostipa neomexicana</i>

## Physiographic features

This site is on risers of fan terraces, footslopes and shoulders of broad, stable landslides. Soils are moderately to very deep and are very cobbly & gravelly. Slopes range from 15-60%.

**Table 2. Representative physiographic features**

Landforms	(1) Terrace (2) Fan (3) Landslide
Flooding duration	Extremely brief (0.1 to 4 hours)
Flooding frequency	None to rare
Ponding duration	Very brief (4 to 48 hours)
Ponding frequency	None to rare
Elevation	1,463–2,042 m
Slope	15–60%
Aspect	Aspect is not a significant factor

## Climatic features

Winter summer moisture ratios range from 70:30 to 60:40. Late spring is usually the driest period, and early fall moisture can be sporadic. Summer rains fall from June through September; moisture originates in the Gulf of Mexico and creates convective, usually brief, intense thunderstorms. Cool season moisture from October through May tends to be frontal; it originates in the Pacific and the Gulf of California and falls in widespread storms with longer duration and lower intensity. Precipitation generally comes as snow from December through February. Accumulations above 12 inches are not common but can occur. Snow usually lasts for 3-4 days, but can persist much longer. Summer daytime temperatures are commonly 95 - 100 F and on occasion exceed 105 F. Winter air temperatures can regularly go below 10 F and have been recorded below - 20 F.

**Table 3. Representative climatic features**

Frost-free period (average)	168 days
Freeze-free period (average)	193 days
Precipitation total (average)	356 mm

## Influencing water features

### Soil features

Soils are moderately to very deep. Surface textures are very cobbly fine sandy loam & extremely gravelly sandy loam. Subsoil coarse fragments range from gravelly to very cobbly with textures of sand, fine sandy loam to clay loam and one known non-coarse fragment soil of silty clay loam. Parent material is alluvium and colluvium derived from sandstone, basalt, siltstone, and quartz diorite. Available water capacity is low to moderate. Water erosion hazard is moderate. Wind erosion hazard is slight to moderate. Soils are none-to-very slightly saline and sodic. pH range is 6.6-9.0. Soil moisture regime is ustic aridic. Soil temperature regime is mesic.

Typical taxonomic units on this site include:

SSA 701 Grand Canyon Area MU 163 Wauquie family;  
SSA 711 Navajo Mountain Area MU 67 Ustic Torriorthents;  
SSA 713 Chinle Area MU's 63 Ustic torriorthents & 64 Ustic Haplocambids (rocky);  
SSA 715 Fort Defiance Area AZ/NM MU 9 Strych family;  
SSA 717 Shiprock Area AZ/NM MU's 316 Millett, 310 Strych, and 319 Skyhawk.

**Table 4. Representative soil features**

Parent material	(1) Alluvium—sandstone and siltstone (2) Colluvium—basalt
Surface texture	(1) Very cobbly fine sandy loam (2) Extremely gravelly sandy loam (3) Very gravelly loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Slow to moderately rapid
Soil depth	89–152 cm
Surface fragment cover ≤3"	10–35%
Surface fragment cover >3"	0–25%
Available water capacity (0–101.6cm)	6.35–17.78 cm
Calcium carbonate equivalent (0–101.6cm)	5–30%
Electrical conductivity (0–101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0–101.6cm)	0–13
Soil reaction (1:1 water) (0–101.6cm)	6.6–9
Subsurface fragment volume ≤3" (Depth not specified)	15–20%
Subsurface fragment volume >3" (Depth not specified)	5–10%

## Ecological dynamics

An ecological site is not a precise assemblage of species for which the proportions are the same from place to place or from year to year. In all plant communities, variability is apparent in productivity and occurrence of individual species. Spatial boundaries of the communities; however, can be recognized by characteristic patterns of species composition, association, and community structure. The historic climax plant community for this ecological site has been described by sampling relict or relatively undisturbed sites and/or reviewing historic records. The historic climax plant community is the plant community that evolved over time with the soil forming process and long term changes in climatic conditions of the area. It is the plant community that was best adapted to the unique combination of environmental factors associated with the site.

Natural disturbances, such as drought, fire, grazing of native fauna, and insects, are inherent in the development and maintenance of these plant communities. The effects of these disturbances are part of the range of characteristics of the ecological site. Fluctuations in plant community structure and function caused by the effects of natural disturbances help establish the boundaries and characteristics of an ecological site. They are accounted for as part of the range of characteristics of the ecological site. Recognizable plant community phases are identified in the reference state of the ecological site. Some sites may have a small range of variation, while others have a large range. Some plant community phases may exist for long periods of time, while others may only occur for a couple of years after a disturbance.

Deterioration of the plant community, hydrology, or soil site stability on an ecological site can result in crossing a threshold or potentially irreversible boundary to another state, or equilibrium. This can occur as a result of the loss of soil surface through erosion, the loss of the stability of the site due to disturbances that cause active erosion on the site, increases in the amounts and/or patterns or runoff from rainstorms, changes in availability of surface and subsurface water, significant changes in plant structural and functional types, or the introduction of non-native

species. When these thresholds are crossed, the potential of the ecological site to return to the historic climax plant community can be lost, or restoration will require significant inputs . There may be multiple states possible for an ecological site, determined by the type and or severity of disturbance.

The known states and transition pathways for this ecological site are described in the state and transition model. Within each state, there may be one or more known plant community phases. These community phases describe the different plant community that can be recognized and mapped across this ecological site. The state and transition model is intended to help land users recognize the current plant community on the ecological site, and the management options for improving the plant community to the desired plant community.

Plant production information in this site description is standardized to the annual production on an air-dry weight basis in near normal rainfall years.

State and transition model

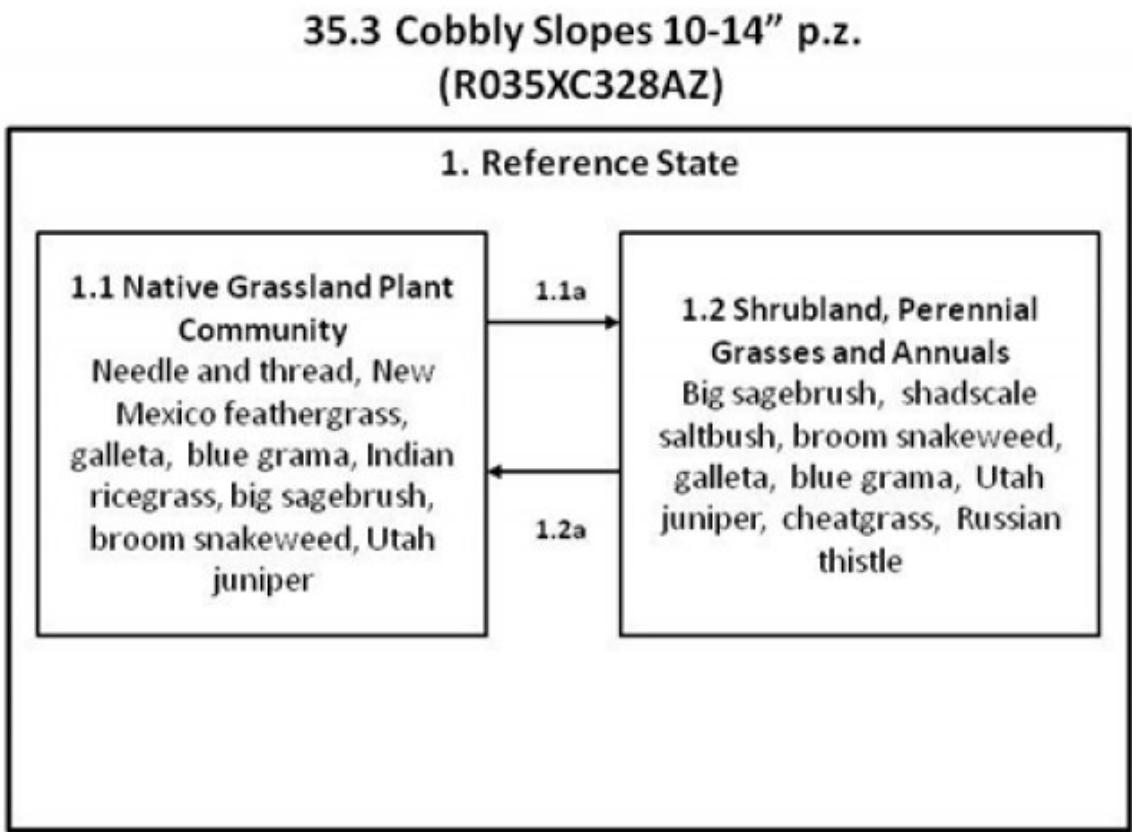


Figure 4. 35.3 Cobbly slopes

State 1  
Reference State

This site is a grassland with minor amounts of shrubs, perennial forbs and scattered trees. With disturbance perennial grass species will decrease and shrubs will increase. Non-native annual species may be present in minor amounts.

## Community 1.1

### Native Grassland Plant Community



Figure 5. Cobbly Slopes 10-14"p.z.

This site is a grassland with minor amounts of shrubs and scattered trees. Major grasses include needle and thread, New Mexico feathergrass, galleta, black grama, blue grama and Indian ricegrass. Common shrubs present are Wyoming big sagebrush and broom snakeweed. Utah juniper can be present in minor amounts.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	314	471	628
Shrub/Vine	17	50	84
Tree	6	22	28
Forb	11	17	28
<b>Total</b>	<b>348</b>	<b>560</b>	<b>768</b>

Table 6. Ground cover

Tree foliar cover	0-5%
Shrub/vine/liana foliar cover	0-5%
Grass/grasslike foliar cover	5-15%
Forb foliar cover	0-3%
Non-vascular plants	0%
Biological crusts	0%
Litter	10-20%
Surface fragments >0.25" and <=3"	10-35%
Surface fragments >3"	0-25%
Bedrock	0%
Water	0%
Bare ground	15-30%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	—	—	—	1-3%
>0.15 <= 0.3	—	—	5-10%	—
>0.3 <= 0.6	—	1-3%	0-5%	—
>0.6 <= 1.4	0-2%	1-3%	—	—
>1.4 <= 4	0-5%	—	—	—
>4 <= 12	—	—	—	—
>12 <= 24	—	—	—	—
>24 <= 37	—	—	—	—
>37	—	—	—	—

Figure 7. Plant community growth curve (percent production by month). AZ3501, 35.3 10-14" p.z. needle and thread. Growth starts in spring and extends into summer, plants may be green in the fall..

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

Figure 8. Plant community growth curve (percent production by month). AZ3503, 35.3 10-14" p.z. galleta. Growth begins in spring, most growth occurs during summer and early fall rainy season. Plants will green up again in the fall..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	0	5	20	15	20	30	10	0	0

Figure 9. Plant community growth curve (percent production by month). AZ3508, 35.3 10-14" p.z. Wyoming big sagebrush. Most growth occurs in spring and early summer. Stem elongation and seed set occur in the fall..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	15	30	20	10	10	10	0	0

Figure 10. Plant community growth curve (percent production by month). AZ3531, 35.3 10-14" p.z. all sites. Growth begins in the spring and continues through the summer..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	3	17	18	10	19	20	10	1	1	0

## Community 1.2

### Shrubland, Perennial Grasses and Annual Species

This plant community has an increase of composite shrubs, such as snakeweed, Bigelow sage and/or Wyoming big sagebrush. There is also a slight increase of cacti, yucca, annual species and possibly trees. Perennial grass composition has been reduced by competition with shrubs and annuals.

### Pathway 1.1A

#### Community 1.1 to 1.2

Unmanaged grazing and/or drought, exclusion of fire.

### Pathway 1.2A

#### Community 1.2 to 1.1

Managed grazing, favorable climatic conditions, woody species control, invasive weed control.

**Additional community tables**

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
0	<b>Cool Season Grasses</b>			191–336	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	84–140	–
	New Mexico feathergrass	HENE5	<i>Hesperostipa neomexicana</i>	56–84	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	56–84	–
	squirreltail	ELELE	<i>Elymus elymoides ssp. elymoides</i>	6–28	–
1	<b>Warm Season Grasses</b>			135–291	
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	56–84	–
	black grama	BOER4	<i>Bouteloua eriopoda</i>	28–56	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	28–56	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–28	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	6–28	–
	Fendler's threeawn	ARPUF	<i>Aristida purpurea var. fendleriana</i>	0–11	–
	alkali sacaton	SPAI	<i>Sporobolus airoides</i>	0–11	–
<b>Forb</b>					
2	<b>Forbs</b>			11–28	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	45–67	–
	New Mexico feathergrass	HENE5	<i>Hesperostipa neomexicana</i>	45–67	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	45–67	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	6–28	–
	Forb, annual	2FA	<i>Forb, annual</i>	6–17	–
<b>Shrub/Vine</b>					
3	<b>Shrubs</b>			17–84	
	black grama	BOER4	<i>Bouteloua eriopoda</i>	22–45	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	22–45	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	0–28	–
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	6–28	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	0–17	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	6–17	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	6–11	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	0–11	–
	Bigelow sage	ARBI3	<i>Artemisia bigelovii</i>	0–6	–
	narrowleaf yucca	YUAN2	<i>Yucca angustissima</i>	0–6	–
<b>Tree</b>					
4	<b>Trees</b>			6–28	
	Utah juniper	JUOS	<i>Juniperus osteosperma</i>	6–28	–
	squirreltail	ELELE	<i>Elymus elymoides ssp. elymoides</i>	4–22	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	4–22	–
	twoneedle pinyon	PIED	<i>Pinus edulis</i>	0–6	–



## Animal community

This site is suitable for grazing by stocker cattle, horses, and sheep during spring, summer and fall with a good variety of plants.

The potential plant community provides a variety of food and cover plants for wildlife. Water can be scarce in natural springs or pockets. The topography is difficult for livestock because of the presence of cobbles but provides escape habitat for wildlife.

Wildlife found on this site include ground squirrels, snakes, blacktail jackrabbits, lizards and mule deer.

## Recreational uses

Site is typically on edges of broad stable landslides and low terraces. It produces high desert grasslands which can be very picturesque.

Winters are cold, however, relatively mild spring, fall and summer months are attractive to recreationists.

Activities include hunting, cross-country riding, photography, hiking, rock collecting, and wildlife observation

## Type locality

Location 1: Apache County, AZ	
Township/Range/Section	T38N R31E S6
General legal description	Horse Mesa quad; Section 6, T38N, R31E; 1.6 miles South of Oak Spring, Navajo Indian Reservation, Arizona

## Other references

Updates and revisions for this ESD were conducted as part of a 2007-2012 Interagency Technical Assistance Agreement between the Bureau of Indian Affairs–Navajo Region and NRCS-Arizona.

## Contributors

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## Rangeland health reference sheet

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

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Date	10/28/2010
Approved by	Byron Lambeth
Approval date	

## Indicators

1. **Number and extent of rills:** Rills formation is slight and infrequent across the site. Most rills are mostly found on exposed areas on steep slopes. Moderate permeability and abundance of surface rock fragments would mask rill formation.

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2. **Presence of water flow patterns:** Water flow patterns are scattered on this site and plant distribution and exposed rock cover will depict where they will be present.

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3. **Number and height of erosional pedestals or terracettes:** There will be some slight pedestalstalling or terracettes in association with water flow patterns. Slight mounding will occur around the bases of long lived perennial plants and should not be considered pedestals.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground varies from 15-30%.

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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:** None

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7. **Amount of litter movement (describe size and distance expected to travel):** Most herbaceous and fine woody litter will remain in place, but fine litter (<1/4" diameter) will be transported by wind and water movement in flow paths and rills. Coarse woody litter and duff will accumulate under shrub and tree canopies.

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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):** The soil surface is protected by a wide range of rock fragments (15% to 60%) and by an average litter amount of 10%. Soil stability will be 1.5 to 3.0 in open areas and 3.0 to 5.0 under plant canopies.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** The A horizon varies in depth from 2" to 6" and is generally gravelly soils with pebbles, gravels, cobbles and stones. Textures are mostly gravelly fine sandy loam and very cobbly fine sandy loam, with a weak medium platy structure parting to a moderate fine granular consistency. Please note, that the soil survey for the area you are at should be referenced to get more specific information about the soil you are assessing.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** This is a scattered plant community that is predominated by grasses (75%-85%) with a mixture of shrubs (5%-10%) and minor amounts of trees and forbs (up to 5% for each). This in combination with

the rock fragments in the soil profile help promote infiltration and reduce runoff. The average distance the nearest perennial plant (fetch) ranges from 13-16".

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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 expected on this site due to loamy textures and high rock fragment content.
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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: Cool season grasses > warm season grasses

Sub-dominant: Large shrubs > half-shrubs

Other: Forbs > Trees > succulents

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** In average years plant mortality is expected to be low (1 to 5%) in grasses and shrubs. During and after drought years there can be from 5 to 20% die off of shrubs, grasses and trees. Severe winter droughts affect shrubs, trees and cool season grasses the most. Severe summer droughts affect the warm season grasses the most.
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14. **Average percent litter cover (%) and depth ( in):** Most litter will accumulate below plant canopies or near plant bases.
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Average annual production on this site is expected to be 450-550 lbs./ac. in a year of average annual precipitation.
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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:** Species that can invade are cheatgrass, broom snakeweed, Russian thistle, Utah juniper and can increase with time.
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17. **Perennial plant reproductive capability:** All plants native to this site are adapted to the climate and are capable of producing seeds, stolons and rhizomes except during the most severe droughts.
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