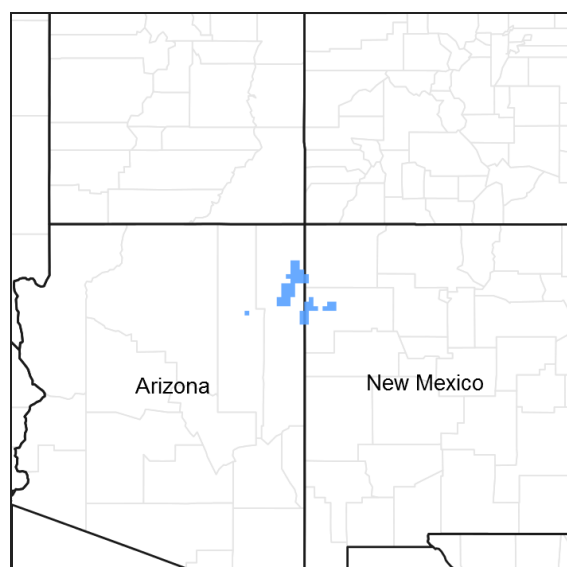


## **Ecological site DX035X03B633** **Colluvial Slopes 13-17" p.z. (PIED)**

Accessed: 05/13/2025

### 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

This ecological site occurs in Common Resource Area 35.6 - the Colorado Plateau Pinyon-Juniper-Sagebrush

The Common Resource Area occurs within the Colorado Plateau Physiographic Province. Elevations range from 5800 to 7300 feet and precipitation averages 13 to 17 inches per year. Vegetation includes pinyon, juniper, big sagebrush, cliffrose, Mormon tea, muttongrass, prairie junegrass, squirreltail, western wheatgrass, and blue grama. The soil temperature regime is mesic and the soil moisture regime is aridic ustic. 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>Pinus edulis</i>
Shrub	(1) <i>Cercocarpus montanus</i> (2) <i>Amelanchier utahensis</i>
Herbaceous	(1) <i>Poa fendleriana</i>

## Legacy ID

F035XF633AZ

### Physiographic features

This site occurs on footslopes of hills and cuestas and on backslopes below cuestas and mesas. Rock outcrops and badlands are associated with this site. Slopes generally range from 15-65%, but can range up to 75% in some locations.

**Table 2. Representative physiographic features**

Landforms	(1) Hill (2) Cuesta (3) Mesa
Flooding frequency	None
Ponding frequency	None
Elevation	1,768–2,225 m
Slope	15–65%
Aspect	Aspect is not a significant factor

### Climatic features

The climate of this land resource unit is semiarid with warm summers and cool winters. The mean annual precipitation ranges from 13 – 17 inches, but it is very erratic, often varying substantially from year to year. The majority of the precipitation comes from October through April. This precipitation comes as gentle rain or snow from frontal storms coming out of the Pacific Ocean. Snow is common from November through February. Generally no more than a few inches of snow accumulates, melting within a few days, but may last a week or more. The remaining precipitation comes from July through September as spotty, unreliable and sometimes violent thunderstorms. The moisture for this precipitation originates in the Gulf of Mexico (and the Pacific Ocean in the fall) and flows into the area on the north end of the Mexican monsoon. Late May through late June is generally a dry period. The mean annual air temperature ranges from 47 to 49 degrees Fahrenheit (F). The frost-free period (air temperature > 32 degrees F) ranges from 113 to 144 days (@ 50 percent probability). Strong winds are common, especially in the spring.

**Table 3. Representative climatic features**

Frost-free period (average)	144 days
Freeze-free period (average)	160 days
Precipitation total (average)	432 mm

### Influencing water features

#### Soil features

Soils on this site are alluvium, colluvium and residuum derived from siltstone, sandstone and shale and range from shallow to deep. Surface textures range from fine sandy loam to loam to clay loam and can be extremely flaggy, gravelly or channery. Subsurface textures include very cobbly to very channery sandy loams to clay loams. The soil moisture regime is Aridic Ustic and the temperature regime is Mesic.

Typical taxonomic units include:

SSA-713 Chinle Area MU 49 Aridic Ustorthents;  
SSA-715 Ft. Defiance Area AZ/NM MU 120 Toldohn;

**Table 4. Representative soil features**

Parent material	(1) Alluvium—sandstone (2) Colluvium—shale (3) Residuum—siltstone
Surface texture	(1) Gravelly loam (2) Very channery clay loam (3) Extremely flaggy fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to moderate
Soil depth	20–191 cm
Surface fragment cover ≤3"	0–30%
Surface fragment cover >3"	0–25%
Available water capacity (0–101.6cm)	5.08–15.24 cm
Calcium carbonate equivalent (0–101.6cm)	0–10%
Electrical conductivity (0–101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0–101.6cm)	0–5
Soil reaction (1:1 water) (0–101.6cm)	6.6–8.4
Subsurface fragment volume ≤3" (Depth not specified)	0–15%
Subsurface fragment volume >3" (Depth not specified)	0–25%

## 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

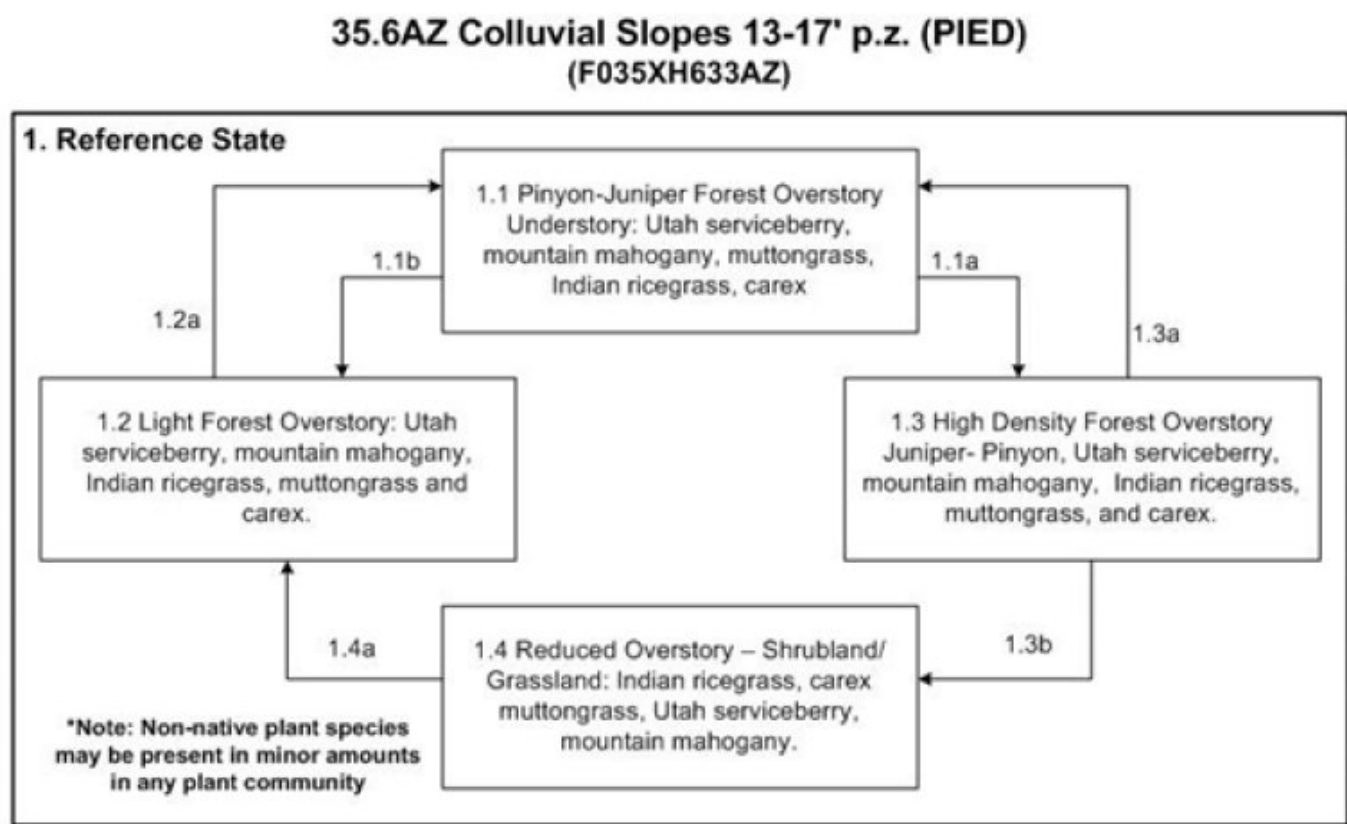


Figure 4. 35.6 Colluvial Slopes 13-17"p.z.(PIED)

### State 1 Reference State

On this forested site, pinyon and juniper trees dominate the overstory with shrubs, grasses, forbs and small trees in the understory.

## Community 1.1

### Reference Community Juniper-Pinyon Forest



Figure 5. Colluvial Slopes 13-17" p.z

This forest plant community is dominated by a canopy cover of 35-50% trees such as Colorado pinyon, at 80% dominance, and Utah juniper at 20%. The understory is dominated by shrubs like mountain-mahogany & Utah serviceberry with some perennial grasses like muttongrass & Indian ricegrass, forbs, succulents and young trees.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	252	379	504
Grass/Grasslike	50	76	101
Forb	17	26	34
Tree	17	26	34
<b>Total</b>	<b>336</b>	<b>507</b>	<b>673</b>

Table 6. Ground cover

Tree foliar cover	40-50%
Shrub/vine/liana foliar cover	50-75%
Grass/grasslike foliar cover	10-15%
Forb foliar cover	0-5%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0-30%
Surface fragments >3"	0-25%
Bedrock	0%
Water	0%
Bare ground	0%

Figure 7. Plant community growth curve (percent production by month). AZ3512, 35.6 13-17" p.z. Stansbury cliffrose. Growth begins in spring and continues through the summer. Stem elongation, flowering, and seed set occur in summer..

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

**Figure 8. Plant community growth curve (percent production by month).**  
**AZ3561, 35.6 13-17" p.z. all sites. Growth begins in the spring and continues into the fall..**

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	5	16	17	15	15	15	11	5	0	0

**Figure 9. Plant community growth curve (percent production by month).**  
**AZ3602, 35.6 13-17" p.z. muttongrass. Most growth occurs in early to mid spring, plants may be green in the fall. Seed set occurs by summer..**

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

## **Community 1.2**

### **Light Forest Overstory**

This plant community is characterized by a sparse overstory of woodland species. The crown canopy is less than 35%, ranging from 25-40%. The understory has more production than the 1.1 reference plant community with an increase of grasses and forbs and less shrubs. The understory plant community is comprised of shrubs such as Utah serviceberry and mountain mahogany; grasses such as Indian ricegrass, carex and muttongrass; with forbs and small trees (under 4.5 feet tall).

## **Community 1.3**

### **High Density Overstory**

This plant community is characterized by a dense overstory of woodland species. The crown canopy is greater than 50%. The understory has less production than the 1.1 reference plant community with a decrease of perennial grasses and forbs and less shrubs. The understory plant community is comprised of shrubs such as Utah serviceberry and mountain mahogany; grasses such as Indian ricegrass, carex and muttongrass; with forbs and small trees (under 4.5 feet tall).

## **Community 1.4**

### **Reduced Overstory - Shrubland/Grassland**

This plant community is characterized by a reduced overstory of woodland species. The crown canopy is usually less than 20%, ranging from 5-20%. The understory has more production than the 1.1 plant community with an increase of grasses, forbs and shrubs. The understory plant community is comprised of grasses, shrubs, forbs and trees (under 4.5 feet tall). Common grasses include Indian ricegrass, carex and muttongrass. Dominant shrubs are Utah serviceberry and mountain mahogany.

## **Pathway 1.2a**

### **Community 1.2 to 1.1**

Favorable precipitation, fire exclusion, trees compete with shrubs/grass.

## **Pathway 1.3a**

### **Community 1.3 to 1.1**

Drought, insect infestation, fire.

## **Pathway 1.3b**

### **Community 1.3 to 1.4**

Drought in combination with severe disturbance such as major insect infestation and/or intense fire.

## Pathway 1.4a Community 1.4 to 1.2

Favorable precipitation, seed source for tree regeneration.

### Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Grasses</b>			50–101	
	muttongrass	POFE	<i>Poa fendleriana</i>	11–45	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	11–22	–
	White Mountain sedge	CAGE	<i>Carex geophila</i>	11–22	–
	squirreltail	ELELE	<i>Elymus elymoides ssp. elymoides</i>	6–11	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	6–11	–
<b>Forb</b>					
2	<b>Forbs</b>			17–34	
	Forb, perennial	2FP	<i>Forb, perennial</i>	11–22	–
	beardtongue	PENST	<i>Penstemon</i>	7–11	–
<b>Shrub/Vine</b>					
3	<b>Shrubs</b>			252–504	
	alderleaf mountain mahogany	CEMO2	<i>Cercocarpus montanus</i>	67–157	–
	Utah serviceberry	AMUT	<i>Amelanchier utahensis</i>	67–112	–
	mormon tea	EPVI	<i>Ephedra viridis</i>	13–45	–
	Stansbury cliffrose	PUST	<i>Purshia stansburiana</i>	13–45	–
	Utah snowberry	SYORU	<i>Symphoricarpos oreophilus var. utahensis</i>	13–45	–
	antelope bitterbrush	PUTR2	<i>Purshia tridentata</i>	13–22	–
	Gambel oak	QUGA	<i>Quercus gambelii</i>	13–22	–
	thrift mock goldenweed	STARA	<i>Stenotus armerioides var. armerioides</i>	13–22	–
	cliff fendlerbush	FERU	<i>Fendlera rupicola</i>	13–22	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	13–22	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	13–22	–
4	<b>Succulents</b>			34–67	
	tulip pricklypear	OPPH	<i>Opuntia phaeacantha</i>	13–22	–
	narrowleaf yucca	YUAN2	<i>Yucca angustissima</i>	13–22	–
	banana yucca	YUBA	<i>Yucca baccata</i>	13–22	–
<b>Tree</b>					
5	<b>Trees</b>			17–34	
	twoneedle pinyon	PIED	<i>Pinus edulis</i>	13–27	–
	Utah juniper	JUOS	<i>Juniperus osteosperma</i>	4–11	–

**Table 8. Community 1.1 forest overstory composition**

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
<b>Tree</b>							
Utah juniper	JUOS	<i>Juniperus osteosperma</i>	Native	0.3–6.1	25–30	2.5–38.1	–
twoneedle pinyon	PIED	<i>Pinus edulis</i>	Native	1.5–12.2	15–20	5.1–25.4	–

## Animal community

Suitability for grazing by livestock is fair because of topography. Cattle, sheep, goats and horses can use this site in late spring, summer and fall. Management considerations include steep slopes, rocks and badlands which hinder livestock movements.

Wildlife found on this ecological site include: mule deer, coyote, snakes, lizards, cottontail rabbit, blacktail jackrabbit, elk.

Site factors influencing wildlife:

- a. Water: Scattered springs and pockets.
- b. Cover: Good for most species.
- c. Food: Good diversity unless grazing is mismanaged.
- d. Other: Topography provides escape habitat and many species winter here.

## Recreational uses

Recreational activities: Hiking, horseback riding, wildlife observations and photography.

## Wood products

Woodland Overstory Production for Colorado pinyon and Utah juniper:

Site Index: 60-70

Fuelwood (Cords/Ac): 8-10

Fence posts (7ft)/Ac: 10-20

Christmas Trees/Ac: 15-25

CMAI\* per year: 7.5 cuft/ac

Productivity Class: 2

\*CMAI is the culmination of mean annual increment or highest average growth rate of the stand in the units specified.

## Other products

Woodland

1. Equipment and Operability Considerations --

a. Suitable equipment for:

- 1) Harvesting: crawler-tractor type best.
- 2) Site Preparation: crawler-tractor type best.
- 3) Tree planting: best if done by hand.
- 4) Precommercial thinning: crawler-tractor type best.

b. Equipment limitations:

- 1) Slope: Slopes over 20% rocky shallow soils limit equipment use; use crawler tractors.
- 2) Unsurfaced roads: Steeper slopes rocks and rock outcrops are limiting factors.
- 3) Stominess/rock outcrop: Rock outcrop on steep slopes limits use.
- 4) Water table/flooding: None.



## 2. Erosion Potentials --

- a. Cutover areas/bare ground: Water and wind erosion will occur.
- b. Roads/trails/landings: Water and wind erosion will occur; water erosion on steeper slopes will be accelerated.

## 3. Soil management --

- a. Compaction potential: good, soil and cobbles mix well.
- b. Rutting potential: Soils will rut when wet.
- c. Revegetation potential: Poor because of shallow soil and steep slopes.

## 4. Silvicultural potentials and limitations --

- a. Harvest cutting: Harvest mature trees when canopy exceeds 45% and on slopes less than 25%
  - b. Thinning and Improvement: Cutting posts (juniper) and Christmas trees (pinyon) will improve wood growth on trees left.
  - c. Prescribed burning: Not recommended.
- Mechanical tree removal: Not practical; shallow soils and steep slopes limit equipment use.
- d. Suitability for replanting: Poor; shallow soils and steep slopes.
  - e. Seedling mortality: Very shallow and shallow soils make a severe mortality.
  - f. Natural regeneration: Slow, but will occur in time.
  - g. Seedling protection: Seedlings should be protected from grazing.
  - h. Plant competition: Severe because of competition for limited moisture.
  - i. Windthrow hazard: Severe, shallow rooting depth for the most part.

Table 9. Representative site productivity

Common Name	Symbol	Site Index Low	Site Index High	CMAI Low	CMAI High	Age Of CMAI	Site Index Curve Code	Site Index Curve Basis	Citation
twoneedle pinyon	<i>PIED</i>	60	70	5	8	75	200	—	
Utah juniper	<i>JUOS</i>	30	35	3	4	—	—	N/A	Howell, Joseph Jr. 1940. Pinon [sic] and juniper, a preliminary study of volume, growth and yield. USDA, Soil Conservation Service. Region 8 Regional Bulletin 71, Forest Series 12.
twoneedle pinyon	<i>PIED</i>	30	35	3	4	—	—	N/A	Howell, Joseph Jr. 1940. Pinon [sic] and juniper, a preliminary study of volume, growth and yield. USDA, Soil Conservation Service. Region 8 Regional Bulletin 71, Forest Series 12.

## Type locality

Location 1: Apache County, AZ	
Township/Range/Section	T38N R29E S15
General legal description	Boiling Over Well Quad; Navajo Reservation, Arizona, Section 15, T38N, R29E.

## 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 the 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.

Author(s)/participant(s)	
Contact for lead author	
Date	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

### Indicators

1. **Number and extent of rills:**

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2. **Presence of water flow patterns:**

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3. **Number and height of erosional pedestals or terracettes:**

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

---

5. **Number of gullies and erosion associated with gullies:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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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):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial**

distribution on infiltration and runoff:

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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):**
- 

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:

Sub-dominant:

Other:

Additional:

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**
- 

14. **Average percent litter cover (%) and depth ( in):**
- 

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**
- 

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:**
- 

17. **Perennial plant reproductive capability:**
-