

Ecological site DX035X03B630 **Clay Loam Upland 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.

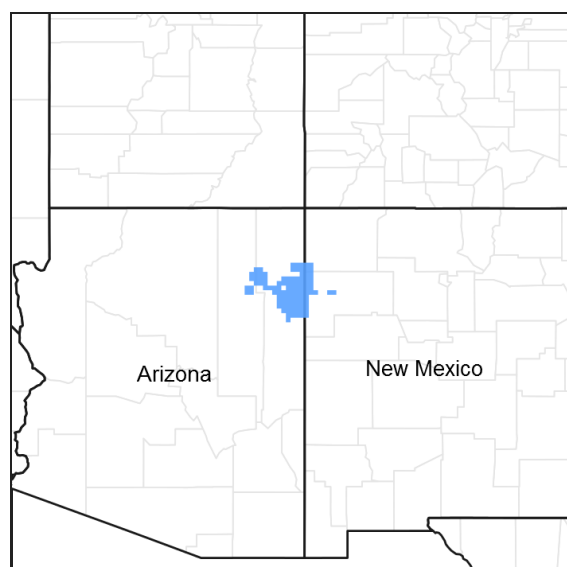


Figure 1. Mapped extent

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> (2) <i>Juniperus osteosperma</i>
Shrub	(1) <i>Artemisia nova</i> (2) <i>Quercus gambelii</i>

Herbaceous	(1) <i>Poa fendleriana</i> (2) <i>Bouteloua gracilis</i>
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Legacy ID

F035XF630AZ

Physiographic features

This ecological site is found on summits of mesas, structural benches and cuestras. The soils are very shallow to shallow with surface textures that are very flaggy, very fine sandy loam and sandy clay. Slopes are generally 5-15%, but may reach as high as 35%.

Table 2. Representative physiographic features

Landforms	(1) Mesa (2) Structural bench (3) Cuesta
Flooding frequency	None
Ponding frequency	None
Elevation	1,768–2,225 m
Slope	5–15%
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

These are shallow soils that lie on the summits of mesas. Surface textures are very flaggy and very fine sandy loam and sandy clay but are only approximately 2" thick. Subsurface soil textures are sandy clay loam, clay loam, gravelly sandy clay loam and flaggy sandy clay loam. The soil parent material is alluvium, residuum derived from sandstone and quartz diorite. Available water capacity is moderate and permeability is slight. The hazard of erosion by wind and water is slight. The water runoff class is medium. These soils are generally non-saline and non-sodic with a pH range of 6.6-8.4. The soil moisture regime is Aridic Ustic and the soil temperature regime is Mesic.

Typical taxonomic units include:

SSA-715 Ft. Defiance Area MU's 31, 32 & 75

Arabrab;

SSA-717 Shiprock Area MU 414 Arabrab.

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone (2) Residuum–quartz-diorite
Surface texture	(1) Very flaggy very fine sandy loam (2) Fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Very slow to moderately slow
Soil depth	20–66 cm
Surface fragment cover ≤3"	0–15%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	12.7–17.78 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)	0–5%
Subsurface fragment volume >3" (Depth not specified)	0%

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

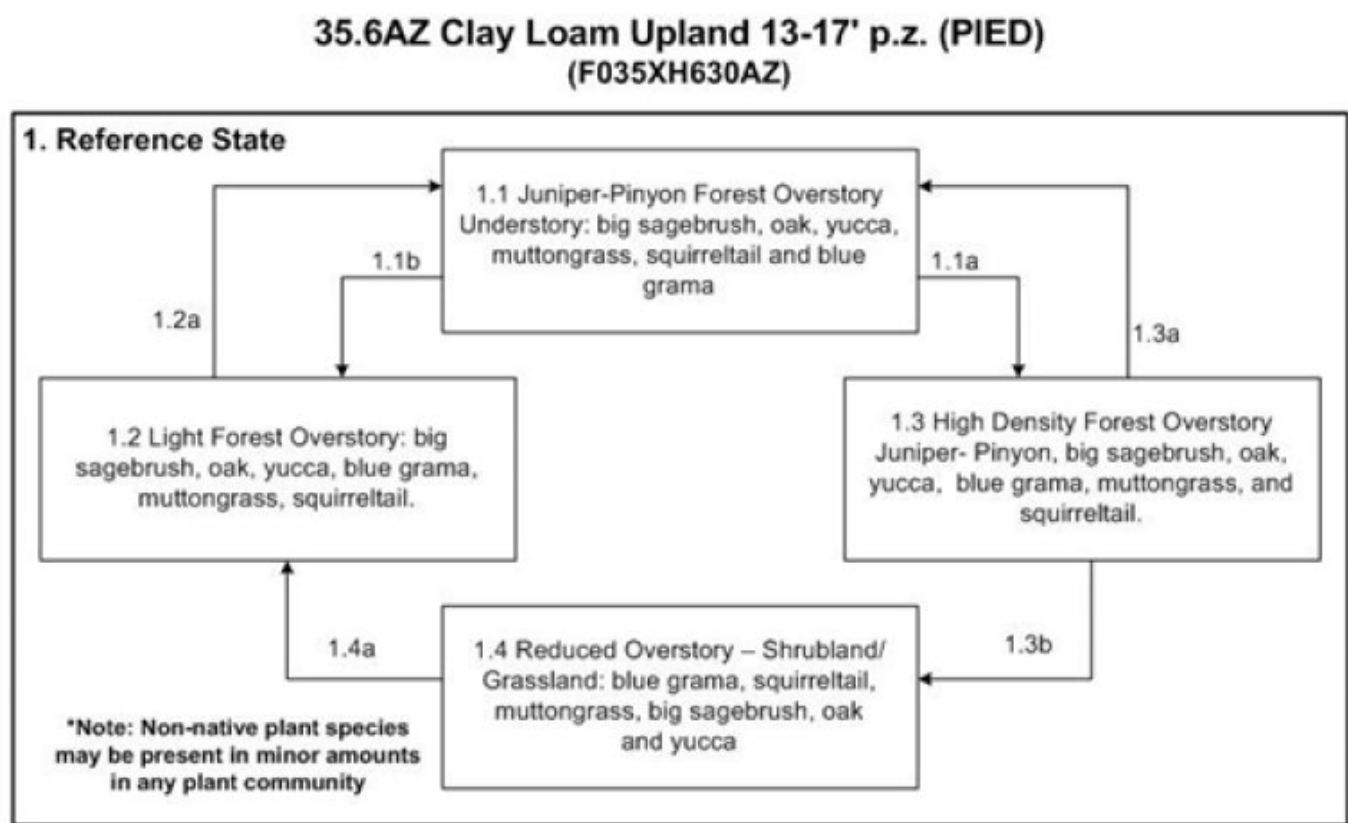


Figure 4. 35.6 Clay Loam Upland 13-17"p.z. (PIED)

State 1

Reference State

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

Community 1.1
Reference Plant Community Juniper-Pinyon Forest



Figure 5. Clay Loam Upland, 13-17"p.z.

This is a woodland site with the overstory dominated by Pinyon (PIED) and Juniper (JUMO). The canopy cover ranges from 55-65%. Pinyon is 75-85% and juniper is 15-25% of the canopy composition. The understory composition is dominated by shrubs (55%); such as black sagebrush, big sagebrush, Gambel oak and Stansbury cliffrose; grasses (30%) such as muttongrass, squirreltail and blue grama; forbs (10%) and trees <4.5' (10%).

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	123	185	247
Grass/Grasslike	67	101	135
Forb	22	34	45
Tree	22	34	45
Total	234	354	472

Table 6. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	—	—	0-20%	—
>0.15 <= 0.3	—	—	—	0-10%
>0.3 <= 0.6	—	0-15%	—	—
>0.6 <= 1.4	—	0-15%	—	—
>1.4 <= 4	40-60%	—	—	—
>4 <= 12	40-60%	—	—	—
>12 <= 24	—	—	—	—
>24 <= 37	—	—	—	—
>37	—	—	—	—

Figure 7. 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 8. 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 plant community with an increase of grasses and forbs and less shrubs. The understory plant community is comprised of grasses, shrubs, forbs and trees (under 4.5 feet tall). Grasses are muttongrass, blue grama and squirreltail. Dominant shrubs include big sagebrush, oak and yucca.

Community 1.3

High Density Overstory

This plant community is characterized by a dense overstory of woodland species. The crown canopy is greater than 55%. The understory has less production than the 1.1 plant community with a decrease of perennial grasses and forbs and less shrubs. The understory plant community is comprised of shrubs such as big sagebrush, oak and yucca; grasses such as muttongrass, squirreltail and bluegrama; 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 25%, ranging from 5-25%. 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 blue grama, squirreltail, and muttongrass. Dominant shrubs include big sagebrush, oak and yucca.

Pathway 1.1b

Community 1.1 to 1.2

Drought, insect infestation, and/or woodcutting

Pathway 1.1a

Community 1.1 to 1.3

Fire exclusion/Lack of natural fire, favorable precipitation, Unmanaged grazing.

Pathway 1.2a

Community 1.2 to 1.1

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

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 (%)
Grass/Grasslike					
1	Grasses			67–135	
	muttongrass	POFE	<i>Poa fendleriana</i>	22–112	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0–22	–
	squirreldtail	ELEL5	<i>Elymus elymoides</i>	0–22	–
Shrub/Vine					
2	Shrubs			123–258	
	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	28–112	–
	Stansbury cliffrose	PUST	<i>Purshia stansburiana</i>	0–22	–
	Gambel oak	QUGA	<i>Quercus gambelii</i>	0–22	–
	Sonoran scrub oak	QUTU2	<i>Quercus turbinella</i>	0–22	–
	Arizona spinystar	ESVIA	<i>Escobaria vivipara</i> var. <i>arizonica</i>	0–6	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0–6	–
5	Succulents			6–11	
	banana yucca	YUBA	<i>Yucca baccata</i>	6–11	–
Forb					
3	Forbs			0–45	
	felwort	SWPE	<i>Swertia perennis</i>	0–6	–
	pinewoods spiderwort	TRPI	<i>Tradescantia pinetorum</i>	0–6	–
	Carruth's sagewort	ARCA14	<i>Artemisia carruthii</i>	0–6	–
	ragleaf bahia	BADI	<i>Bahia dissecta</i>	0–6	–
	Wyoming Indian paintbrush	CALI4	<i>Castilleja linariifolia</i>	0–6	–
	sego lily	CANU3	<i>Calochortus nuttallii</i>	0–6	–
	thymeleaf sandmat	CHSE6	<i>Chamaesyce serpyllifolia</i>	0–6	–
	spreading fleabane	ERDI4	<i>Erigeron divergens</i>	0–6	–
	trailing fleabane	ERFL	<i>Erigeron flagellaris</i>	0–6	–
	fleabane	ERIGE2	<i>Erigeron</i>	0–6	–
	redroot buckwheat	ERRA3	<i>Eriogonum racemosum</i>	0–6	–
	sulphur-flower buckwheat	ERUM	<i>Eriogonum umbellatum</i>	0–6	–
	pineywoods geranium	GECA3	<i>Geranium caespitosum</i>	0–6	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0–6	–

	fineleaf hymenopappus	HYFI	<i>Hymenopappus filifolius</i>	0–6	–
	pingue rubberweed	HYRI	<i>Hymenoxys richardsonii</i>	0–6	–
	scarlet gilia	IPAG	<i>Ipomopsis aggregata</i>	0–6	–
	Wright's deervetch	LOWR	<i>Lotus wrightii</i>	0–6	–
	shortstem lupine	LUBR2	<i>Lupinus brevicaulis</i>	0–6	–
	beardlip penstemon	PEBA2	<i>Penstemon barbatus</i>	0–6	–
	toadflax penstemon	PELI2	<i>Penstemon linarioides</i>	0–6	–
	little hogweed	POOL	<i>Portulaca oleracea</i>	0–2	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0–1	–
Tree					
4	Trees<4.5'			22–45	
	oneseed juniper	JUMO	<i>Juniperus monosperma</i>	0–17	–
	twoneedle pinyon	PIED	<i>Pinus edulis</i>	0–17	–
	ponderosa pine	PIPO	<i>Pinus ponderosa</i>	0–17	–

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)
Tree							
twoneedle pinyon	PIED	<i>Pinus edulis</i>	Native	1.5–9.1	40–60	12.7–35.6	–
Utah juniper	JUOS	<i>Juniperus osteosperma</i>	Native	0.3–6.1	0–15	10.2–35.6	–

Animal community

Suitability for grazing by livestock is good before canopy exceeds 50%. Cattle, sheep, goats and horses can use this site in late spring, summer and fall. Management considerations include use of Prescribed Grazing and reseeding grass following harvest operations for forage and to reduce erosion.

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

Site factors influencing wildlife:

- Water: Scattered springs and pockets.
- Cover: Good for most species.
- Food: Good diversity.
- Other: Topography provides escape habitat.

Recreational uses

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

Other products

1. Livestock

- Suitability for grazing: Poor to fair; steep slopes and low forage production.
- Kind of livestock: Cattle, sheep, goats, and horses.
- Season of use: Late spring, summer, and fall.
- Management considerations: Grazing systems, proper grazing use. Young trees should not be grazed. Steeper slopes will limit livestock use.

Other information

Woodland

1. Equipment and Operability Considerations --

a. Suitable equipment for:

- 1) Harvesting: All kinds; use crawler type or rubber tread equipment.
- 2) Site Preparation: All kinds.
- 3) Tree planting: All kinds; shallow soils and slopes restrict planting.
- 4) Precommercial thinning: All kinds; slope limits use of wheeled equipment.

b. Equipment limitations:

- 1) Slope: Slopes over 20% limit rubber tread equipment; use crawler tractors.
- 2) Unsurfaced roads: Steeper slopes would be a limiting factor.
- 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: Fair, soils don't bind together very 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: Slight; even though soils are shallow, trees root in cracks of sandstone.

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>	85	95	10	12	—	—	—	

Type locality

Location 1: Apache County, AZ	
Township/Range/Section	T40N R29E S27
General legal description	Pastora Peak Quad, Navajo Reservation Arizona, Section 27, T40N, 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:**

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

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

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:**

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

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

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**
-
10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**
-
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:**
-