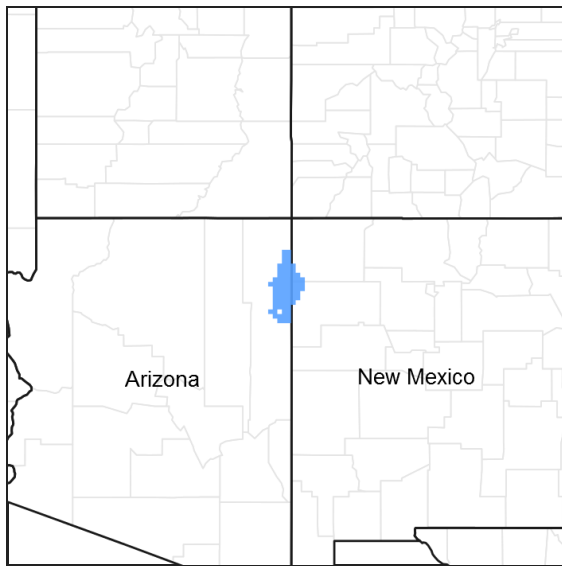


## Ecological site DX035X03B827 Sandstone Hills 17-25" p.z. (PIPO)

Accessed: 08/17/2024

### General information

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



**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 35.8 - the Colorado Plateau Ponderosa Pine Forests

The Common Resource Area occurs within the Colorado Plateau Physiographic Province. Elevations range from 6800 to 8500 feet and precipitation averages 17 to 25 inches per year. Vegetation includes ponderosa pine, white fir, aspen, pinyon, juniper, Gambel oak, big sagebrush, ceanothus, blue elderberry, muttongrass, upland sedge, and big wildrye, mountain muhly, Arizona fescue, pine dropseed, and blue grama. The soil temperature regime ranges from mesic to frigid and the soil moisture regime is typic 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 ponderosa</i> (2) <i>Quercus gambelii</i>
Shrub	(1) <i>Artemisia tridentata</i> var. <i>vaseyana</i> (2) <i>Artemisia tridentata</i> var. <i>wyomingensis</i>

Herbaceous	(1) <i>Muhlenbergia montana</i> (2) <i>Bouteloua gracilis</i>
------------	--

## Legacy ID

F035XH827AZ

## Physiographic features

This ecological site occurs on slopes of plateaus, mesas and knobs. Soils are typically shallow to sandstone with an argillic horizon. The site can have small inclusions of moderately deep soils, or very shallow soils associated with rock outcrop. Slopes range from 15 to 35%, occasionally as high as 45%. The site is well drained and does not benefit significantly from run-on moisture from adjacent sites.

**Table 2. Representative physiographic features**

Landforms	(1) Plateau (2) Mesa
Flooding frequency	None
Ponding frequency	None
Elevation	2,225–2,591 m
Slope	15–35%
Aspect	Aspect is not a significant factor

## Climatic features

Winter-summer moisture ratios are typically 70:30 on the west side of this LRU and shift to 60:40 on the east side. 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 Ocean and the Gulf of California and falls in widespread storms with longer duration and lower intensity. Precipitation generally comes as snow from October into April. Snowpack can persist for 3-4 months, although it may disappear in exposed areas during prolonged dry weather. Summer daytime temperatures are typically 80-90 but can exceed 95 degrees F. Winter temperatures of around 0 degrees F are common and can reach -25 degrees F.

**Table 3. Representative climatic features**

Frost-free period (average)	130 days
Freeze-free period (average)	145 days
Precipitation total (average)	635 mm

## Influencing water features

The site is well drained and does not benefit significantly from run-on moisture from adjacent sites.

## Soil features

The soils on this site are shallow to sandstone; they have formed in place from alluvium and residuum derived from sandstone and shale. The surface textures are fine sandy loams. Subsurface textures are sandy clay loam, and clay loam. An argillic horizon is usually present, although in some cases it has been lost.

Soil survey map unit components correlated to this ecological site include:

Chinle Area(AZ713) Soil Map Unit - 26-Lithic Haplustepts;

**Table 4. Representative soil features**

Parent material	(1) Alluvium–sandstone and shale
Surface texture	(1) Fine sandy loam (2) Loam
Family particle size	(1) Clayey
Drainage class	Well drained to moderately well drained
Permeability class	Moderately slow to moderate
Soil depth	15–51 cm
Surface fragment cover ≤3"	0–10%
Surface fragment cover >3"	10–30%
Available water capacity (0-101.6cm)	5.08–6.35 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–2
Soil reaction (1:1 water) (0-101.6cm)	6.6–7.3
Subsurface fragment volume ≤3" (Depth not specified)	1–20%
Subsurface fragment volume >3" (Depth not specified)	15–30%

## 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

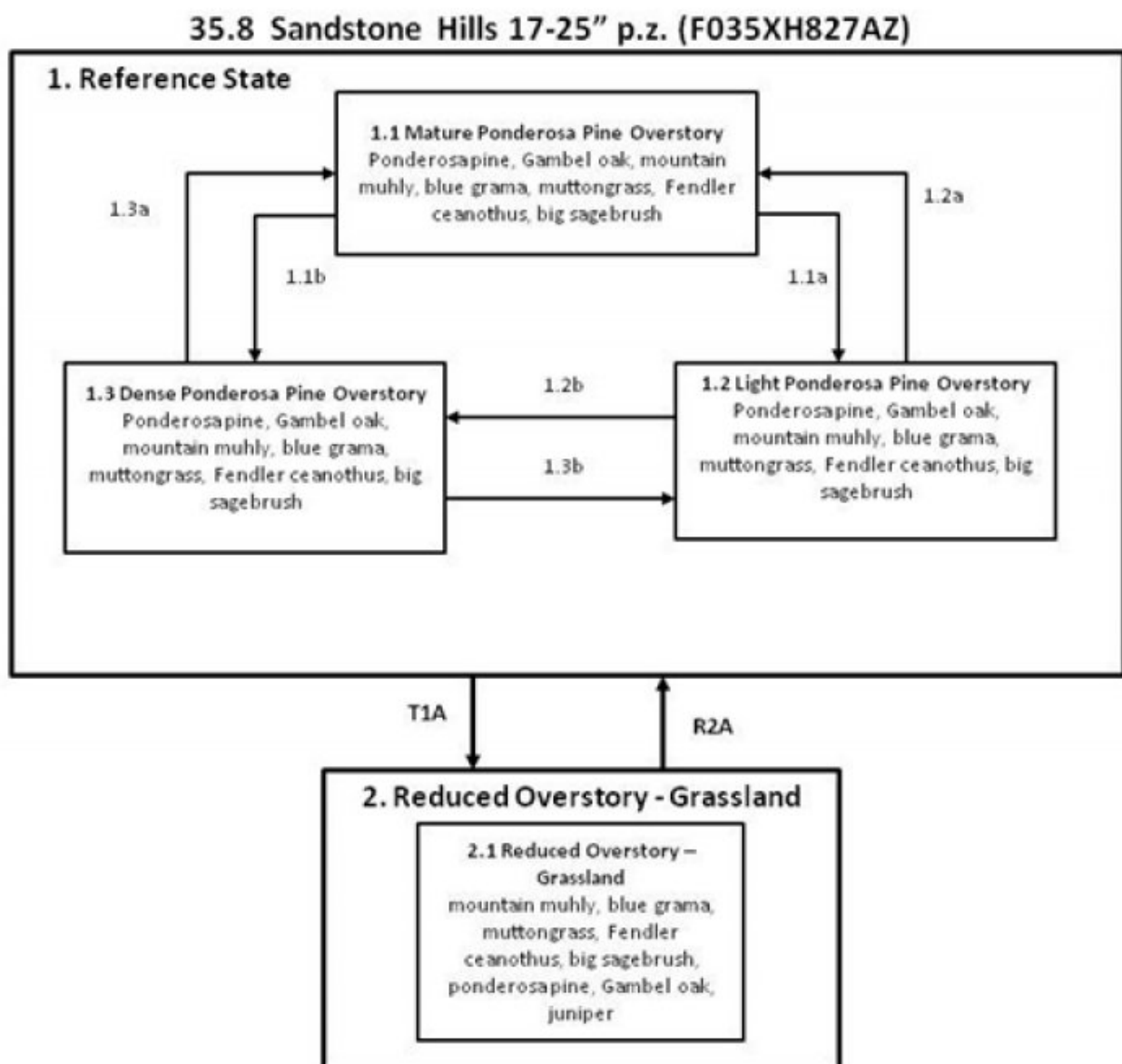


Figure 4. 35.8 Sandstone Hills

### State 1

## Reference State

This forest community is characterized by mature ponderosa pine with shorter trees, shrubs, grasses and forbs in the understory. A minor amount of non-native annuals may be present in the community.

### Community 1.1 Mature Ponderosa Pine Overstory



Figure 5. Sandstone hills 17-25" p.z. (PIPO)

This plant community is dominated by mature ponderosa pine with 20 to 35% canopy cover. Cover may be as high as 50% on north facing slopes with 10 - 20% cover of shorter ponderosa pine, Colorado pine, juniper and Gambel oak in the understory. Shrubs are small (<1 m), scattered and make up less than 2% cover. These include Fendler ceanothus and creeping barberry. Grass and forb species range from 5% to 30% cover with lower cover values in areas of dense tree canopy cover and/or bedrock. Perennial grasses are dominated by mountain muhly and blue grama. Perennial forbs are secondary to grasses.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	224	364	426
Tree	11	56	118
Forb	–	11	67
Shrub/Vine	–	6	45
<b>Total</b>	<b>235</b>	<b>437</b>	<b>656</b>

Table 6. Ground cover

Tree foliar cover	0-25%
Shrub/vine/liana foliar cover	0-2%
Grass/grasslike foliar cover	5-15%
Forb foliar cover	0-5%
Non-vascular plants	0-1%
Biological crusts	0-5%
Litter	20-50%
Surface fragments >0.25" and <=3"	1-15%
Surface fragments >3"	1-10%
Bedrock	5-25%
Water	0%

Bare ground	0-10%
-------------	-------

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	0-1%	0-5%	0-30%	1-5%
>0.15 <= 0.3	0-1%	0-5%	0-5%	0-1%
>0.3 <= 0.6	0-1%	0-1%	0-5%	0-1%
>0.6 <= 1.4	0-5%	0-1%	–	–
>1.4 <= 4	1-10%	0-1%	–	–
>4 <= 12	1-10%	–	–	–
>12 <= 24	10-20%	–	–	–
>24 <= 37	1-10%	–	–	–
>37	–	–	–	–

Figure 7. Plant community growth curve (percent production by month). AZ3581, 35.8 17-25" p.z. all sites. Growth begins in the spring, most growth occurs during the summer rainy season..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	4	10	24	21	23	13	5	0	0

Figure 8. Plant community growth curve (percent production by month). AZ3901, 35.8 17-25" p.z. muttongrass. Growth begins in the spring and extends through the summer rainy season..

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

Figure 9. Plant community growth curve (percent production by month). AZ3902, 35.8 17-25" p.z. Arizona fescue. Growth begins in the late spring and extends through the summer rainy season..

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

Figure 10. Plant community growth curve (percent production by month). AZ3903, 35.8 17-25" p.z. western wheatgrass. Growth begins in the spring, most growth occurs in the summer. Seed set occurs in the fall..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	10	15	25	30	10	5	0	0

## Community 1.2 Light Ponderosa Pine Overstory

This site has a more patchy distribution of ponderosa pine with reduced canopy cover from the 1.1 community. This results in higher understory production on the forest floor of grasses, forbs and shrubs.

## Community 1.3 Dense Ponderosa Pine Overstory

This site has a very dense overstory of smaller pole sized and some mature ponderosa pine with canopy cover from 50-60%. The understory is sparse and shrub dominated.

**Pathway 1.1a**  
**Community 1.1 to 1.2**

Partial removal of mature ponderosa pine canopy through timber harvest, or Bark beetle infestation, fire.

**Pathway 1.1b**  
**Community 1.1 to 1.3**

Openings are filled in by natural regeneration, unmanaged grazing, fire exclusion.

**Pathway 1.2a**  
**Community 1.2 to 1.1**

Trees mature and fill in. Managed grazing, fire suppression.

**Pathway 1.2b**  
**Community 1.2 to 1.3**

Openings are filled in by natural regeneration of Ponderosa pine from fire exclusion, unmanaged grazing.

**Pathway 1.3a**  
**Community 1.3 to 1.1**

Trees are thinned either naturally or through commercial thinning.

**Pathway 1.3b**  
**Community 1.3 to 1.2**

Trees are thinned through fire or timber harvest.

**State 2**  
**Reduced Overstory - Grassland**

This plant community is dominated by perennial grasses with forbs and shrubs and a few scattered trees.

**Community 2.1**  
**Reduced Overstory - Grassland**

Tree canopy has been severely reduced (<5%) and this site becomes dominated by perennial grasses, forbs and shrubs. There is very little ponderosa pine regeneration on this site.

**Transition T1A**  
**State 1 to 2**

Catastrophic fire event leaves only a few scattered ponderosa pine.

**Restoration pathway R1A**  
**State 2 to 1**

Trees canopy increases - fire suppression, tree planting, unmanaged grazing.

**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>					
1	<b>Grasses</b>			224–426	
	mountain muhly	MUMO	<i>Muhlenbergia montana</i>	28–112	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	28–84	–
	muttongrass	POFE	<i>Poa fendleriana</i>	6–56	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	6–56	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–28	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	6–28	–
	Arizona fescue	FEAR2	<i>Festuca arizonica</i>	0–28	–
	pine dropseed	BLTR	<i>Blepharoneuron tricholepis</i>	6–28	–
	sedge	CAREX	<i>Carex</i>	0–17	–
<b>Forb</b>					
2	<b>Forbs</b>			0–67	
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–22	–
	spreading fleabane	ERDI4	<i>Erigeron divergens</i>	0–17	–
	trailing fleabane	ERFL	<i>Erigeron flagellaris</i>	0–11	–
	Wright's deervetch	LOWR	<i>Lotus wrightii</i>	0–11	–
	ragleaf bahia	BADI	<i>Bahia dissecta</i>	0–11	–
<b>Shrub/Vine</b>					
3	<b>Shrubs</b>			0–45	
	creeping barberry	MARE11	<i>Mahonia repens</i>	0–17	–
	Fendler's ceanothus	CEFE	<i>Ceanothus fendleri</i>	0–17	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0–11	–
	Stansbury cliffrose	PUST	<i>Purshia stansburiana</i>	0–11	–
	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	0–11	–
	wax currant	RICE	<i>Ribes cereum</i>	0–6	–
	mountain snowberry	SYOR2	<i>Symphoricarpos oreophilus</i>	0–6	–
<b>Tree</b>					
4	<b>Trees</b>			11–118	
	ponderosa pine	PIPO	<i>Pinus ponderosa</i>	11–56	–
	Gambel oak	QUGA	<i>Quercus gambelii</i>	0–28	–
	Utah juniper	JUOS	<i>Juniperus osteosperma</i>	0–11	–
	Rocky Mountain juniper	JUSC2	<i>Juniperus scopulorum</i>	0–11	–
	twoneedle pinyon	PIED	<i>Pinus edulis</i>	0–11	–

## Animal community

Site is favorable for grazing throughout most of the year except when snow cover restricts availability of forage. Planned grazing systems adapt well to use on this site.

The potential plant community produced by this site provides food for those species of wildlife that utilize grass as a major portion of their diet.

## Recreational uses

This site has a variety of spring and summer flowers which are particularly noticeable after good moisture periods. It



has good aesthetic appeal when not severely disturbed.

Winters are cold, however, relatively mild spring, fall and summer months are attractive to recreationists. Recreational activities most likely to occur are hunting, cross-country riding, photography and wildlife observation.

## Wood products

All kinds of equipment is suitable for harvesting, site preparation, tree planting and pre-commercial thinning. Slopes are non-restrictive. Un-surfaced roads limit equipment when wet. Water erosion is slight to moderate in bare areas; wind erosion is moderate to high.

Compaction potential is good, but soils will rut when wet. Re-vegetation potential is good.

Harvest fully grown trees on a sustained yield basis. Final removal cuts and intermediate cuts are desirable. Thick stands need thinned to improve growth rates of trees left. Periodic ground fires will reduce dense understory vegetation competing for moisture. Slopes are gentle and soils are deep, so mechanical tree removal is not limited. Control unwanted pests to limit tree damage and loss. Fire hazard becomes extreme as understory fuel load builds. Site is good for replanting. There is slight limitation to seedling mortality; expected mortality rate is less than 25%. Natural regeneration is slightly limited; low end of productive pine sites. Seedlings need protection from grazing. Plant competition is moderately limited due to dense grass cover and grazing that may impede regeneration. Wind throw hazard: slight limitation, rooting depth greater than 30".

## Type locality

Location 1: McKinley County, NM	
UTM zone	N
UTM northing	3987350
UTM easting	687701
General legal description	Todlito Park Quad, Defiance Plateau area, Navajo Reservation, South of Assayi Lake area.

## 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

Dean Schlichting  
Ken Gishi  
Larry D. Ellicott

## 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:**
-