Ecological site F042CY021TX
Limestone Mountain (South Aspect) 20-26" PZ

Accessed: 05/17/2024

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.

Associated sites

F042CY020TX	**Limestone Mountain (North Aspect) 20-26" PZ** Limestone Mountain (North Aspect) is on steep north facing slopes mostly above 2,286 m in elevation. Soils are mostly shallow to limestone bedrock and clayey. The reference plant community is a mixed conifer forest.
R042CY102NM	**Shallow Limestone** Shallow Limestone occurs on limestone hills with 10 to 50 percent slope gradient. Soils are shallow to limestone bedrock. HCPC is mixed prairie grassland with scattered forbs, shrubs, and trees.
R042CY109NM	**Loamy** Loamy is a flood plain, stream terrace, arroyo, or basin floor with nongravelly or cobbly soils. HCPC is mixed prairie grassland with scattered shrubs, forbs, and trees.
R042CY745TX	**Limestone Canyon Bottomland** Limestone Canyon is a flood plain, stream terrace, arroyo, or basin floor with very gravelly or cobbly soils. HCPC is mainly riparian woodlands but vegetation is variable due to different soil conditions.

Similar sites

F042CY020TX	**Limestone Mountain (North Aspect) 20-26" PZ** Limestone Mountain (North Aspect) is on steep north facing slopes mostly above 2,286 m in elevation. Soils are mostly shallow to limestone bedrock and clayey. The reference plant community is a mixed conifer forest.

Table 1. Dominant plant species

Tree	(1) *Pinus ponderosa var. scopulorum* (2) *Pinus edulis*
Shrub	(1) *Quercus undulata* (2) *Cercocarpus montanus*
Herbaceous	(1) *Muhlenbergia dubia*

Physiographic features

The site occurs on south facing mountain slopes and ridges. Elevation ranges from 6200 to 8700 feet. Runoff is high on 10 to 20 percent slopes; and very high on slopes over 20 percent.

Table 2. Representative physiographic features

Landforms	(1) Mountain (2) Mountain slope (3) Ridge
Flooding frequency	None
Ponding frequency	None
Elevation	1,890–2,652 m
Slope	10–95%
Aspect	S

Climatic features

The climate of the area is "semi-arid continental."

The average annual precipitation ranges from 13 to 16 inches. Variations of 5 inches, more or less, are not uncommon. Seventy-five percent of the precipitation falls from April to October. Most of the summer precipitation comes in the form of high intensity-short duration thunderstorms.

Temperatures are characterized by distinct seasonal changes and large annual and diurnal temperature changes. The average annual temperature is about 50 degrees F with extremes of -29 degrees F in the winter and 103 degrees F in the summer.

The average frost-free season is 130 to 160 days. The last killing frost is in early May and the first killing frost is in early October.

Both temperature and precipitation favor warm-season species. However, about 40 percent of the precipitation is favorable to cool-season species. This allows the cool-season plants to occupy an important component of this site. The effective precipitation of this site is increased, due to its position on the landscape, by runoff from adjoining sites. This site also serves as a cold air drainageway. These two factors are both favorable to cool-season species and also increase the variety and production of the vegetative community. Strong winds that carry dust from the west and southwest blow across the area from February to June and dry the soil during a critical period for plant growth.

Climate data was obtained from http://www.wrcc.sage.dri.edu/summary/climsmnm.html web site using 50% probability for freeze-free and frost-free seasons using 28.5 degrees F and 32.5 degrees F respectively.

Table 3. Representative climatic features

Frost-free period (average)	173 days
Freeze-free period (average)	187 days
Precipitation total (average)	406 mm

Influencing water features

Soil features

Soils consist of very shallow and shallow, well drained soils that formed in loamy residuum and colluviums weathered from Permian limestone and dolomite bedrock. Soils are typically very cobbly or gravelly and loamy. Water holding capacity is low at the surface but increases to about two inches is the subsurface.

The ecological site is correlated to the Lozen soil component in the following map units:
Guadalupe Mountains National Park Soil Survey:

Victorio-Lozen-Rock outcrop complex, 10 to 60 percent slopes
Victorio-Lozen-Rock outcrop complex, 40 to 95 percent slopes

Table 4. Representative soil features

Parent material	(1) Colluvium–limestone and sandstone (2) Residuum–dolomite
Surface texture	(1) Extremely cobbly loam (2) Very gravelly loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Very slow
Soil depth	15–51 cm
Surface fragment cover <=3"	5–10%
Surface fragment cover >3"	20–30%
Available water capacity (0-101.6cm)	0–5.08 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.6–7.3
Subsurface fragment volume <=3" (Depth not specified)	15–20%
Subsurface fragment volume >3" (Depth not specified)	20–30%

Ecological dynamics

The reference plant community or potential for this site is considered to be a Ponderosa pine-pinyon pine-alligator juniper forest. Tree cover typically does not exceed 35 percent due limiting available soil moisture on south facing slopes. A mix of both warm and cool season grasses including big bluestem, yellow indiangrass, pine muhly, pinyon ricegrass, and bottlebrush squirrel tail comprise the herbaceous layer. Common shrubs include wavyleaf oak, mountain mahogany, cliff fendlerbush, and New Mexico agave. At the time of European settlement the site was most likely a heterogonous mix of plant communities that reflected the various stages of plant succession following natural disturbances. In addition to natural disturbances, forest composition is highly dependent on topographic position, elevation, and available soil moisture.

The natural disturbance that is the most influential driver of vegetation dynamics is fire. Historically, high frequency and low to mid severity fires shaped the plant communities (Ahlstrand 1980, Sakulich and Taylor 2007). In a fire scar study, Ahlstrand (1980) indentified a mean fire interval of 4.7 years for all fires occurring between 1554 and 1842. Most of these fires were sparked by lightening although some could have been started my Mescalero Apaches who inhabited the area in the 1800s. European settlement that introduced diseases and military campaigns brought an end to the Apache settlements. The reduction of fires slowly initiated during this time period. Other disturbances such as disease, falling of dead trees, and drought also influence the plant communities

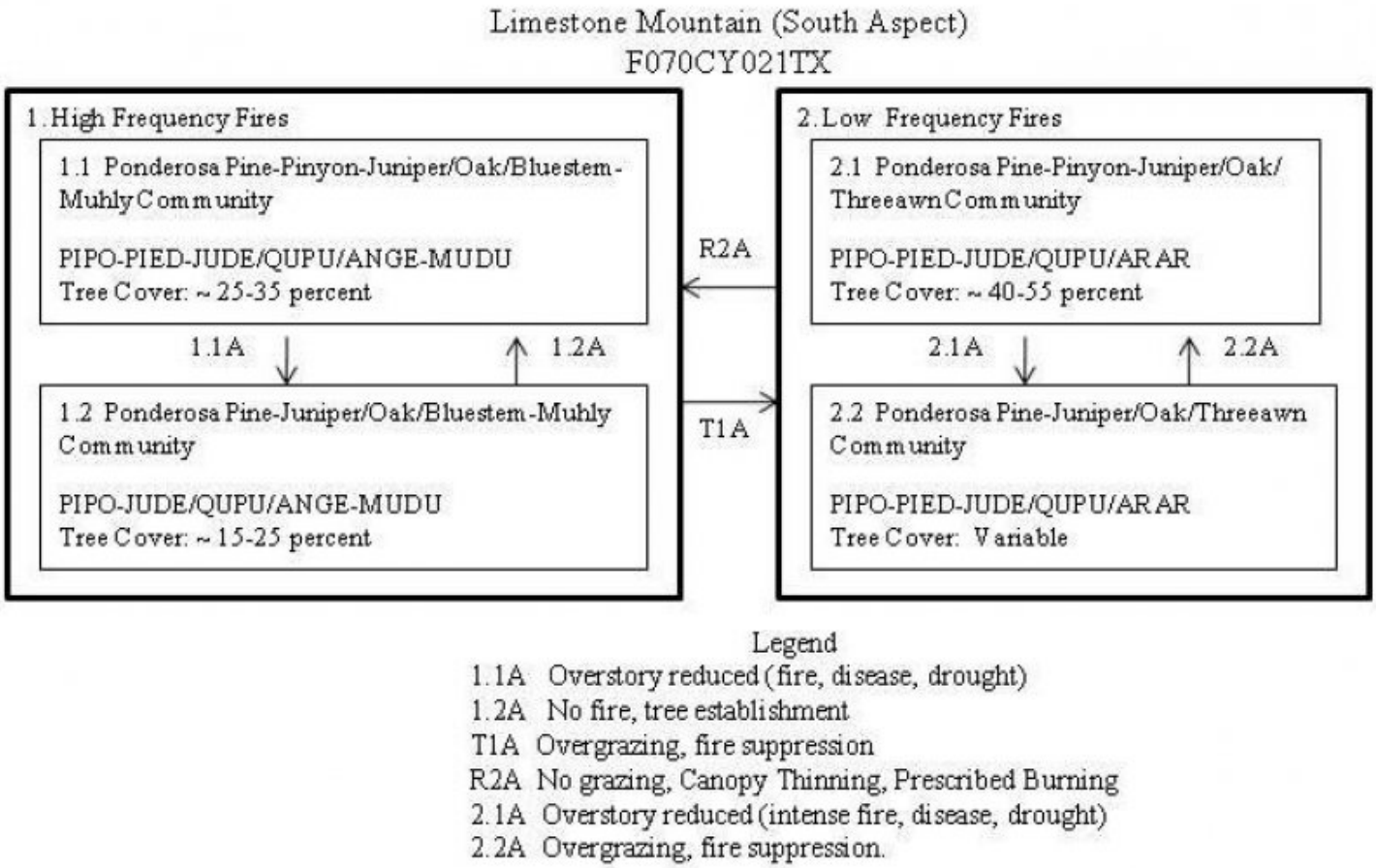
A post-fire community phase would have a reduced tree and shrub canopy layer. Pinyon pine is very susceptible to fire damage depending on stand structure and understory and it is usually absent from a post-fire early successional stage (NPS 2005). Shade intolerant warm season grasses would dominate this phase.

At Guadalupe Mountains National Park, sheep and goat grazing began on this site in the 1920s about 40 years later that many similar areas in New Mexico. This coincides with the cessation of fire at the park (Sakulich and Taylor 2007). Overgrazing of livestock will reduce the fine fuels needed to carry fires and thereby increase the density of

trees. A combination of fire suppression and fire will shift the dynamics of this forest ecosystem into an alternate state. Frequent low intensity burn will be limited if herbaceous layer and understory fuel is reduced. Vegetation composition and dynamics would be altered.

The following diagram suggests general pathways that the vegetation on this site might follow. There are other plant communities and states not shown on the diagram. This information is intended to show what might happen in a given set of circumstances; it does not mean that this would happen the same way in every instance. Local professional guidance should always be sought before pursuing a treatment scenario.

State and transition model



State 1
High Frequency Fire State

The reference community is the Ponderosa Pine-Pinyon-Juniper/Oak/Bluestem-Muhly Community. It is characterized by a dominance of ponderosa pine. Associated trees include pinyon pine, alligator juniper, oneseed juniper, and Gambel's oak. Big bluestem, little bluestem, yellow indiangrass, Muhlenbergia species, and needlegrasses are common warm and cool-season grasses. The south facing aspect prevents closed canopy forest from occurring. The Ponderosa Pine-Juniper/Oak/Bluestem-Muhly Community is a post-fire community in an early to mid successional stage. Most tree and shrub cover is reduced. Wavyleaf oak will be a part of this community since in rapidly resprouts following fires. Shade intolerant warm-season grasses and will dominated the herbaceous layer with scattered forbs.

Community 1.1
Ponderosa Pine-Pinyon-Juniper/Oak/Bluestem-Muhly Community

Figure 4. 1.1 Pine-Pinyon-Juniper/Oak/Bluestem-Muhly (3)

Figure 5. 1.1 Pine-Pinyon-Juniper/Oak/Bluestem/Muh

Figure 6. 1.1 Pine-Pinyon-Juniper/Oak/Bluestem-Muhly (2)

This community is the potential or reference plant community. It is characterized by a dominance of ponderosa pine. Associated trees include pinyon pine, alligator juniper, oneseed juniper, and Gambel’s oak. Common shrubs include wavyleaf oak, mountain mahogany, cliff fendlerbush, banana yucca, and New Mexico agave. Big bluestem, little bluestem, yellow indiangrass, bull muhly, pine muhly, mountain muhly, pinyon ricegrass, squirreltail, and needlegrasses are common warm and cool season grasses. The south facing aspect prevents closed canopy forest from occurring. Abundant fuels are available to carry frequent lightning caused fires. Ecological processes are optimized in this phase.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2242	2802	3363
Shrub/Vine	448	673	897
Forb	56	112	168
Tree	–	–	–
Total	**2746**	**3587**	**4428**

Figure 8. Plant community growth curve (percent production by month). NM4327, Pine-Pinyon-Juniper/Oak/Bluestem-Muhly. Characterized by a dominance of ponderosa pine. Associated trees include pinyon pine, alligator juniper, one-seed juniper, and Gambel's oak. .

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	1	3	3	10	15	25	25	10	5	1

Community 1.2
Ponderosa Pine-Juniper/Oak/Bluestem-Muhly Community

The Ponderosa Pine-Juniper/Oak/Bluestem-Muhly Community is a post-fire community in an early to mid successional stage. Most tree and shrub cover is reduced. Depending on fire severity, pinyon pine can be absent due to its fire sensitivity. Ponderosa pine can survive considerable scorching (FEIS 2010). Wavyleaf oak will be a part of this community since in rapidly resprouts following fires. Shade intolerant warm-season grasses and will dominated the herbaceous layer with scattered forbs.

Pathway 1.1A
Community 1.1 to 1.2

Overstory reduced due to fire, disease, and drought conditions.

Pathway 1.2
Community 1.2 to 1.1

No fire and tree establishment.

State 2
Low Frequency Fire State

The Ponderosa Pine-Pinyon-Juniper/Oak/Threeawn Community is characterized by a low cover of grasses and increased woody shrubs and trees such as juniper and pinyon pine. Unpalatable grasses are common. Other grasses composition will fluctuate depending on grazing intensity. The Ponderosa Pine-Juniper/Oak/Threeawn Community is a post-fire community in an early to mid successional stage. Most tree and shrub cover is reduced with the exception of wavyleaf oak which rapidly resprouts following fires. Depending on fire severity, pinyon pine can be absent due to its fire sensitivity.

Community 2.1
Ponderosa Pine-Pinyon-Juniper/Oak/Threeawn Community

This phase is characterized by a low cover of grasses and increased woody shrubs and trees such as juniper and pinyon pine. Unpalatable grasses are common. Other grasses composition will fluctuated depending on grazing intensity. Fuels needed to carry periodic fires have been reduced due to overgrazing. The relatively dry and warm south facing slopes will limit the canopy cover of trees. Prescribed grazing or nor grazing can help restore fire frequency.

Community 2.2

Ponderosa Pine-Juniper/Oak/Threeawn Community

This community phase is a post-fire community in an early to mid successional stage. Most tree and shrub cover is reduced with the exception of wavyleaf oak which rapidly resprouts following fires. Depending on fire severity, pinyon pine can be absent due to its fire sensitivity. Ponderosa pine can survive considerable scorching (FEIS 2010). Shade intolerant warm-season grasses and will dominated the herbaceous layer with scattered forbs. Composition of grasses will depend on grazing intensity.

Pathway 2.1A
Community 2.1 to 2.2

When overstory is reduced due to intense fires, diseases, and drought conditions, the Ponderosa Pine-Pinyon-Juniper/Oak/Threeawn Community will shift to the Ponderosa Pine-Juniper/Oak/Threeawn Community.

Pathway 2.2A
Community 2.2 to 2.1

With overgrazing and fire suppression, the Ponderosa Pine-Juniper/Oak/Threeawn Community will shift to the Ponderosa Pine-Pinyon-Juniper/Oak/Threeawn Community.

Transition T1A
State 1 to 2

With overgrazing and fire suppression, the High Frequency Fires will shift to the Low Frequency Fires.

Restoration pathway R2A
State 2 to 1

With no grazing, canopy thinning, and prescribed burning, the Low Frequency Fire State will be restored to the High Frequency Fire State.

Conservation practices

Prescribed Burning

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**warm-season tallgrasses**			1121–1681	
	big bluestem	ANGE	*Andropogon gerardii*	280–673	–
	bullgrass	MUEM	*Muhlenbergia emersleyi*	280–673	–
	little bluestem	SCSC	*Schizachyrium scoparium*	280–673	–
	Indiangrass	SONU2	*Sorghastrum nutans*	280–673	–
2	**warm-season midgrasses**			673–1009	
	pine muhly	MUDU	*Muhlenbergia dubia*	224–560	–
	longawn muhly	MUSP4	*Muhlenbergia spiciformis*	224–560	–
	mountain muhly	MUMO	*Muhlenbergia montana*	56–168	–
	plains lovegrass	ERIN	*Eragrostis intermedia*	56–168	–
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	56–168	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	28–84	–
	blue grama	BOGR2	*Bouteloua gracilis*	28–84	–

	blue grama	BOGR2	*Bouteloua gracilis*	28–84	–
	bulb panicgrass	PABU	*Panicum bulbosum*	28–84	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	11–56	–
	common wolfstail	LYPH	*Lycurus phleoides*	11–56	–
	Arizona threeawn	ARAR6	*Aristida arizonica*	11–56	–
3	**cool-season midgrasses**			448–673	
	Arizona fescue	FEAR2	*Festuca arizonica*	112–336	–
	New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	56–112	–
	finestem needlegrass	NATE3	*Nassella tenuissima*	56–112	–
	pinyon ricegrass	PIFI	*Piptochaetium fimbriatum*	56–112	–
	Pringle's speargrass	PIPR2	*Piptochaetium pringlei*	28–84	–
	littleawn needlegrass	ACLO7	*Achnatherum lobatum*	28–84	–
	nodding brome	BRAN	*Bromus anomalus*	28–84	–
	squirreltail	ELEL5	*Elymus elymoides*	28–84	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	28–84	–
Tree					
4	**Trees**			–	
	alligator juniper	JUDE2	*Juniperus deppeana*	–	5–15
	ponderosa pine	PIPOS	*Pinus ponderosa var. scopulorum*	–	5–15
	twoneedle pinyon	PIED	*Pinus edulis*	–	1–10
	Gambel oak	QUGA	*Quercus gambelii*	–	1–5
	oneseed juniper	JUMO	*Juniperus monosperma*	–	1–5
Shrub/Vine					
5	**Shrubs**			359–717	
	pungent oak	QUPU	*Quercus pungens*	224–560	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	112–224	–
	cliff fendlerbush	FERU	*Fendlera rupicola*	56–168	–
	desert ceanothus	CEGR	*Ceanothus greggii*	56–168	–
	eggleaf silktassel	GAOV	*Garrya ovata*	28–84	–
6	**Fibrous/Succulents**			90–179	
	Havard's century plant	AGHA	*Agave havardiana*	34–84	–
	tree cholla	CYIMI	*Cylindropuntia imbricata var. imbricata*	11–56	–
	Texas sacahuista	NOTE	*Nolina texana*	11–56	–
	pricklypear	OPUNT	*Opuntia*	11–56	–
	banana yucca	YUBA	*Yucca baccata*	11–56	–
Forb					
7	**Perennial forbs**			56–157	
	Forb, perennial	2FP	*Forb, perennial*	6–56	–
	white sagebrush	ARLUM2	*Artemisia ludoviciana ssp. mexicana*	6–17	–
	buckwheat	ERIOG	*Eriogonum*	6–17	–
	Drummond's false pennyroyal	HEDR	*Hedeoma drummondii*	6–17	–
	slimleaf plainsmustard	SCLI12	*Schoenocrambe linearifolia*	6–17	–

8	**Annual forbs**			0–11	
	Forb, annual	2FA	*Forb, annual*	0–11	–

Animal community

Slope gradients limit the use of this site for cattle. The site can potentially be suitable for a prescribed grazing system for sheep and goats but available water is a limiting factor. The site provides excellent habitat for wildlife.

Wildlife that utilized this site includes mule deer, elk, black bears, gray foxes, striped and hog-nosed skunks, porcupine, and mountain lions. Mountain short-horned lizards also utilized this site. In addition, mountaintop forests provide a unique habitat that attracts a variety of birds including the mountain chickadee, white-breasted nuthatch, dark-eyed junco, bushtit, acorn woodpecker, and the pine siskin. Chickadees and nuthatches are often seen in mixed species flocks flitting through the pines looking for seeds and insects. In the mid 1980's, Montezuma quail were reintroduced in the Guadalupe Mountains after being eliminated in the mid 1900's Western screech owl, great-horned owl, and flammulated owl can also be seen or heard in the forests (NPS 2010).

Plant Preference by Animal Kind:
These preferences are somewhat general in nature as the preferences for plants is dependent upon grazing experience, time of year, availability of choices, and total forage supply.

Legend: P=Preferred D=Desirable U=Undesirable N=Not Consumed T=Toxic X=Used, but not degree of utilization unknown
Preferred – Percentage of plant in animal diet is greater than it occurs on the land
Desirable – Percentage of plant in animal diet is similar to the percentage composition on the land
Undesirable – Percentage of plant in animal diet is less than it occurs on the land
Not Consumed – Plant would not be eaten under normal conditions. Only consumed when other forages not available.
Toxic – Rare occurrence in diet and, if consumed in any tangible amounts results in death or severe illness in animal

Hydrological functions

The site is located in both a surface water run-in and runoff position.

Recreational uses

The site is suited for hiking and camping.

Wood products

Not Available

Other products

Not Available

Other information

Not Available.

Inventory data references

Information presented here has been developed from NRCS clipping, composition, plant cover, soils data and ecological interpretations gained by field observation.

Other references

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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:**

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):**

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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:**

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17. **Perennial plant reproductive capability:**
