

Ecological site R030XD152CA Hyperthermic Saline Hill

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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.

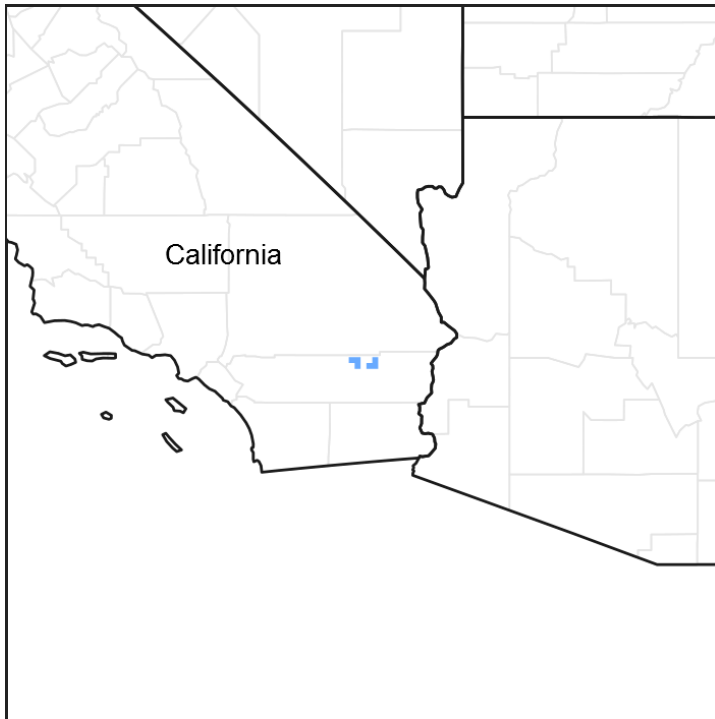


Figure 1. Mapped extent

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): 030X–Mojave Basin and Range

MLRA Description:

Major Land Resource Area (MLRA) 30, Mojave Desert, is found in southern California,

southern Nevada, the extreme southwest corner of Utah and northwestern Arizona within the Basin and Range Province of the Intermontane Plateaus. The climate of the area is hot (primarily hyperthermic and thermic; however at higher elevations, generally above 5000 feet, mesic, cryic and frigid) and dry (aridic). Elevations range from below sea level to over 12,000 feet in the higher mountain areas found within the MLRA. Due to the extreme elevational range found within this MLRA, Land Resource Units (LRUs) were designated to group the MLRA into similar land units.

LRU Description:

This Land Resource Unit (designated by 'XD') is found on the eastern side of California. Elevations range from 400 to 2200 feet on average, but may be found up to 3600 feet on southern exposures. Precipitation ranges from 1 to 6 inches per year, but averages between 2-4 inches. This LRU is characterized primarily by the extreme aridity, hot temperatures, hyperthermic soil temperatures and low stature of widely spaced vegetation. Temperatures can reach over 110 degrees Fahrenheit for several weeks in July and August. Summer precipitation falls between July and September, ranging from 20-33% in the form of rain, and winter precipitation falls starting in November and ends between February and March, ranging from 56-70%, also mostly in the form of rain. Vegetation is primarily small, widely-spaced, low-producing creosote bush (*Larrea tridentata*), burrobrush (*Ambrosia dumosa*), and brittlebush (*Encelia farinosa*).

Ecological Site Concept –

This ecological site occurs on basalt hills and lava flows at elevations of 980 to 2200 feet. Soils are formed from basalt, and very shallow to bedrock with gravelly surface textures. Calcium carbonate accumulations on the soil surface are common.

Vegetation is very sparse, with low cover and low production. Production reference value (RV) is 46 pounds per acre, and depending on precipitation and annual forb production, ranges from 25 to 68 pounds per acre. The site is dominated by desertholly (*Atriplex hymenelytra*), and brittlebush (*Encelia farinosa*) and creosote bush (*Larrea tridentata*) are secondary shrubs. Hyperthermic soil temperatures, very shallow soils with low permeability and high pH and calcium carbonate content at shallow depths are the most important abiotic factors driving this ecological site. Harsh edaphic conditions with high moisture stress restrict production and cover, and limit dominance to the very drought-tolerant, salt-secreting desertholly.

The data in the following physiographic, climate, soils, and community phase sections is based on all components (major and minor) associated with this ecological site.

Classification relationships

Atriplex hymenelytra Shrubland Alliance (Sawyer et al. 2009).

Associated sites

R030XD001CA	<p>Hyperthermic Dry Hills</p> <p>This ecological site is found on adjacent north-facing slopes at higher elevations. Burrobush (<i>Ambrosia dumosa</i>) and creosote bush (<i>Larrea tridentata</i>) dominate.</p>
R030XD003CA	<p>Hyperthermic Steep South Slopes</p> <p>This ecological site is found on adjacent, less saline, south-facing slopes. Brittlebush (<i>Encelia farinosa</i>) is dominant.</p>
R030XD014CA	<p>Hyperthermic Sandy Plains</p> <p>This ecological site is found on adjacent sandsheets. Big galleta (<i>Pleuraphis rigida</i>) is dominant.</p>

Similar sites

R030XB152CA	<p>Saline Hill 3-5" P.Z.</p> <p>This ecological site is found on soils with a thermic soil temperature regime. Production, cover and species diversity are higher. Burrobush (<i>Ambrosia dumosa</i>) is an important species.</p>
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Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Atriplex hymenelytra</i> (2) <i>Encelia farinosa</i>
Herbaceous	Not specified

Physiographic features

This ecological site occurs on basalt hills and lava flows, typically on south-facing aspects, at elevations of 980 to 2200 feet and slopes of 15 to 30 percent. Runoff class is very high.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Lava flow
Flooding frequency	None
Ponding frequency	None
Elevation	299–671 m
Slope	15–30%
Aspect	S, W

Climatic features

The climate of this ecological site is characterized by hot temperatures, aridity, and a bimodal precipitation pattern. Precipitation falls as rain, with 30 percent falling in summer between July and October, and 65 percent falling in winter between November and March. The mean annual precipitation is 3 to 5 inches and mean annual air temperature is 68 to 73 degrees F. The frost free period is 300 to 340 days.

Maximum and minimum monthly climate data for this ESD were generated by the Climate Summarizer

(http://www.nm.nrcs.usda.gov/technical/handbooks/nrph/Climate_Summarizer.xls) using data

from the following climate stations (results are unweighted averages):

42598, Eagle Mountain, CA (Period of record = 1933 to 2011) [1]

43855, Hayfield Reservoir, CA (Period of record = 1933 to 2011) [1]

049099, Twentynine Palms, California (Period of record = 1935 to 2011) [1]

The data from multiple weather were combined to most accurately reflect the climatic conditions of this ecological site.

Table 3. Representative climatic features

Frost-free period (average)	340 days
Freeze-free period (average)	0 days
Precipitation total (average)	127 mm

Influencing water features

Soil features

The soils typically associated with this ecological site formed in colluvium derived from basalt over residuum derived from basalt. These soils are very shallow to bedrock, and occur on basalt hills and lava flows. These soils are calcareous and alkaline, with calcium carbonate accumulation in subsurface horizons and on the soil surface, and pH of 8.8 in the Bk horizon. Surface textures are gravel, with loamy subsurface textures. Surface gravels (< 3 inches in diameter) are approximately 80 percent, and larger fragments are approximately 10 percent. Subsurface gravels by volume (for a depth of 0 to 10 inches) range from 60 to 80 percent and larger fragments by volume range from 0 to 10 percent. Soils are well drained with slow permeability.

The associated soil series correlated with this site is: Missionwell (loamy-skeletal, mixed, superactive, calcareous, hyperthermic Lithic Torriorthents).

This ecological site is correlated with the following soil survey areas, map units and soil components (Soil survey area; Mapunit symbol; Mapunit name; Component; phase; percent):

CA794;1410;Missionwell-Rock outcrop complex, 15 to 50 percent slopes;Missionwell;strongly alkaline;3

CA803;1410;Missionwell-Rock outcrop complex, 15 to 50 percent slopes;Missionwell;strongly alkaline;3

Table 4. Representative soil features

Parent material	(1) Colluvium–basalt
Surface texture	(1) Gravel
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow
Soil depth	8–25 cm
Surface fragment cover ≤3"	80%
Surface fragment cover >3"	10%
Available water capacity (0-101.6cm)	0.51–1.02 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.8
Subsurface fragment volume ≤3" (Depth not specified)	60–80%
Subsurface fragment volume >3" (Depth not specified)	0–10%

Ecological dynamics

Abiotic Factors

Hyperthermic soil temperatures, very shallow soils with low permeability and high pH and calcium carbonate content at shallow depths are the most important abiotic factors driving this ecological site. The vegetation community is very sparse, with low production and diversity. The site is dominated by desertholly, and brittlebush and creosote bush are typically sparsely present.

Highly alkaline soils restrict dominance to desertholly, a small, evergreen, salt-secreting, C4 shrub associated with hot temperatures, and often, alkaline or saline soils in the Mojave and Sonoran Deserts (Welsh 1997, Sawyer et al. 2009). Desertholly is well-adapted to very hot environments by utilizing the less water intensive C4 photosynthesis, maximizing growth during cooler parts of the year, and by leaf adaptations that adjust solar radiation interception (Pearcy et al. 1974, Mooney et al. 1977). Steeply-angled leaves avoid direct solar radiation during the hottest parts of the day, but have maximum interception in morning and evening when temperatures are cooler (Mooney et al. 1977). Desertholly also makes seasonal adjustments to moisture stress by increasing leaf reflectance during the hot, dry periods of the year by decreasing leaf moisture and concentrating salts on leaf hairs (Mooney et al. 1977). Creosote bush and brittlebush are both tolerant of hot temperatures with extreme moisture stress, but are limited by soil pH above 8.5.

Low soil moisture availability and high surface rock fragment cover limits forb production and cover, but during years of average to above average precipitation, forbs comprise 33 to 37 percent of production on this site.

Disturbance dynamics

The primary disturbance influencing this ecological site is drought, and the naturalization of non-native species. Vegetation cover is so sparse that fire is not a management concern on this ecological site.

Drought is an important shaping force in Mojave Desert plant communities (Webb et al. 2003, Bowers 2005, Hereford et al. 2006, Miriti et al. 2007). Short-lived perennial demonstrate the highest rates of mortality (Webb et al. 2003, Bowers 2005, Hereford et al. 2006, Miriti et al. 2007), and annual species remain dormant in the soil seedbank (Beatley 1969, 1974, 1976). Long-lived shrubs are more likely to exhibit branch-pruning, and or limited recruitment during drought (e.g. Hereford et al. 2006, Miriti et al. 2007), leading to reduced cover and biomass in drought-afflicted communities. In this ecological site, drought can cause near complete mortality of shrubs, leaving barren rocky soil surfaces (Sawyer et al. 2009).

Non-native annual species such as red brome (*Bromus rubens*), Mediterranean grass (*Schismus barbatus*), redstem stork's bill (*Erodium cicutarium*) and Asian mustard (*Brassica tournefortii*) have become naturalized throughout the Mojave Desert over the

past century (Rickard and Beatley 1965, D'Antonio and Vitousek 1992, Brooks 1999, Reid et al. 2006, Norton et al. 2007). Non-native species are naturalized in this ecological site, but their influence is minimal given the harsh environmental conditions.

State and transition model

R030XD152CA Hyperthermic Saline Hill

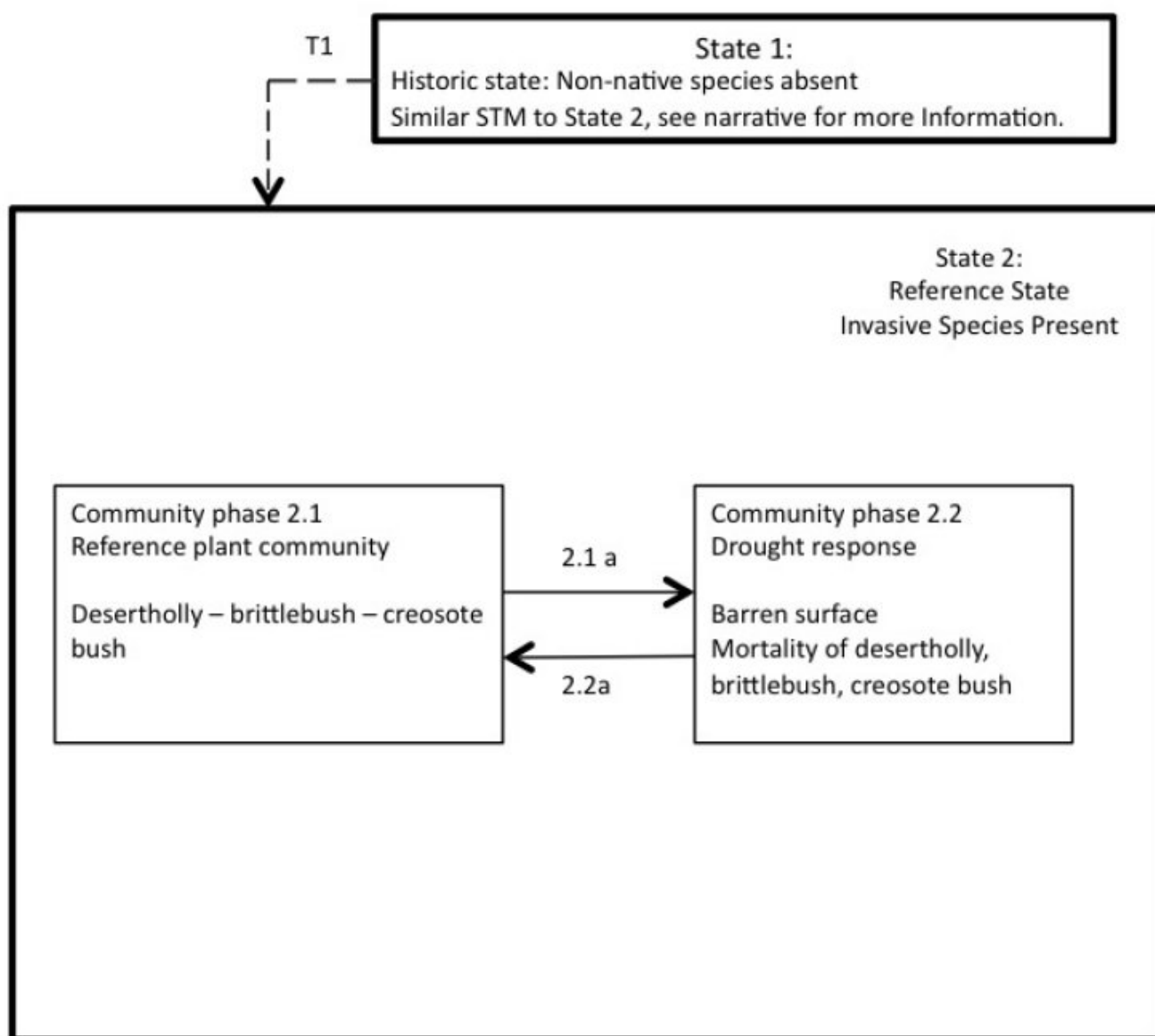


Figure 4. R030XD152CA

State 1

Historic State

State 1 represents the historic range of variability for this ecological site. This state no longer exists due to the ubiquitous naturalization of non-native species in the Mojave Desert. Periodic drought was the natural disturbance influencing this ecological site. Data for this State does not exist, but dynamics and composition would have been similar to State 2, except with only native species present. See State 2 narrative for more detailed information.

Community 1.1

Historic Reference Community

This community phase no longer exists due to the naturalization of non-native species in the Mojave Desert. The historic reference community composition would have been similar to community phase 2.1, but without non-native species.

State 2

Reference State

State 2 represents the current range of variability for this site. Non-native annuals, including Mediterranean grass, are naturalized in this plant community. Their abundance varies with precipitation, but they are at least sparsely present (as current year's growth or present in the soil seedbank).

Community 2.1

Reference Plant Community



Figure 5. Community Phase 2.1



Figure 6. Soil surface carbonate accumulations

The reference plant community consists of sparse, small shrubs, with barren gravels, cobbles and stones dominating the soil surface. Desert holly is the dominant shrub, and creosote bush and brittlebush are sparsely present. Native annual forbs are present with average to above average winter precipitation, and common species include queen's-root (*Stilingia linearifolia*), buckwheat (*Eriogonum* ssp), smooth desertdandelion (*Malacothrix glabrata*), blazingstar (*Mentzelia* ssp), and desert Indianwheat (*Plantago ovata*). The non-native annual Mediterranean grass is sparsely present.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	22	34	45
Forb	6	17	28
Grass/Grasslike	–	1	3
Total	28	52	76

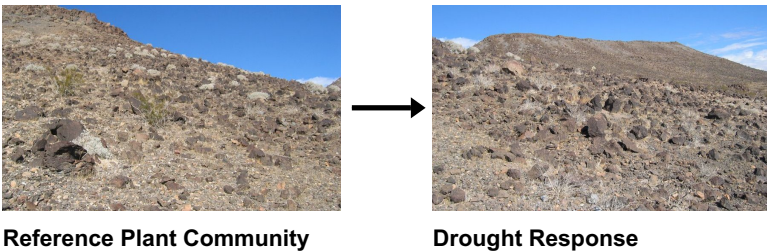
Community 2.2 Drought Response



Figure 8. Community Phase 2.2

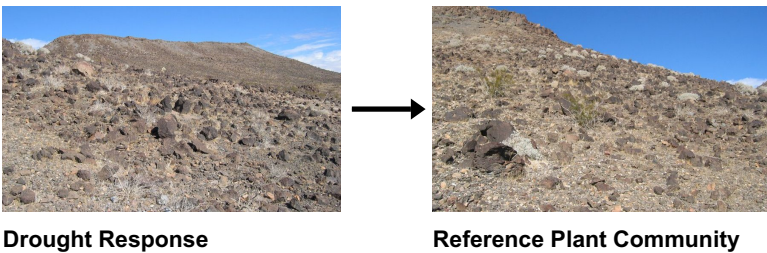
This community phase is characterized by declines in cover and production due to branch-pruning, mortality, and lack of recruitment of desert holly, brittlebush, and creosote bush, and lack of emergence of forb species. Desertholly recruitment is episodic, dependent on precipitation, and may occur as infrequently as 20 plus years (Sawyer et al. 2009).

**Pathway 2.1a
Community 2.1 to 2.2**



This pathway occurs with prolonged or severe drought.

**Pathway 2.2a
Community 2.2 to 2.1**



This pathway occurs with time and a return to average or above average precipitation conditions. Forb species recovery occurs first, followed by desertholly recruitment from the soil seedbank. Creosote bush recruitment is dependent on adequate summer precipitation. Brittlebush colonizes by dispersal from off-site seed sources.

Transition 1 State 1 to 2

This transition occurred with the naturalization of non-native species in this ecological site. Non-native species were introduced with settlement of the Southwest Desert region in the 1860s.

Additional community tables

Table 6. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
1	Native shrubs			22–45	
	desertholly	ATHY	<i>Atriplex hymenelytra</i>	17–39	2–5
	brittlebush	ENFA	<i>Encelia farinosa</i>	1–4	0–1
	creosote bush	LATR2	<i>Larrea tridentata</i>	1–4	0–1
Forb					
2	Native forbs			1–17	
	Forb, annual	2FA	<i>Forb, annual</i>	0–11	0–1
	smooth desertdandelion	MAGL3	<i>Malacothrix glabrata</i>	0–2	0–2
	buckwheat	ERIOG	<i>Eriogonum</i>	0–2	0–1
	blazingstar	MENTZ	<i>Mentzelia</i>	0–1	0–1
	desert Indianwheat	PLOV	<i>Plantago ovata</i>	0–1	0–1
	queen's-root	STLI3	<i>Stillingia linearifolia</i>	0–1	0–1
Grass/Grasslike					
3	Non-native annual grasses			0–1	
	Mediterranean grass	SCHIS	<i>Schismus</i>	0–1	0–1

Animal community

This site provides habitat for small mammals such as antelope ground squirrels, desert woodrats, and canyon and long-tailed pocket mice.

This site provides habitat for lizards, such as the western whiptail, desert collared lizard, and chuckwalla; and snakes such as gopher, coachwhip, western patch-nosed and

speckled rattlesnake. Depth to bedrock is a restrictive feature to burrowing reptiles, such as the desert tortoise.

Birds common to this site include black-throated sparrows, rock wrens, common ravens and raptors.

LIVESTOCK GRAZING:

This site has limited use for livestock grazing due to low production, steep slopes and lack of stock water.

Recreational uses

This site is highly valued for open space and those interested in desert ecology.

Inventory data references

The following NRCS plots were used to describe this ecological site:

CC-19 (Type location)

Type locality

Location 1: San Bernardino County, CA	
UTM zone	N
UTM northing	3759246
UTM easting	619902
General legal description	The type location is approximately 0.71 miles northwest (306 degrees) from the Pinto Wells Historic Site on Old Dale Road in Joshua Tree National Park.

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:**

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:**
