USDA Natural Resources
Conservation Service

Ecological site R040XD001CA
Limy Hill 4-6" p.z.

Accessed: 11/13/2024

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): 040X–Sonoran Basin and Range

MLRA Description:
Major land resource area (MLRA) 31 is the Lower Colorado Desert. This area is in the extreme southeastern part of California, in areas along the Colorado River, and in Western Arizona. The area is comprised of rough, barren, steep, and strongly dissected mountain ranges, generally northwest to southwest trending that are separated by intermontane basins. Elevation ranges from approximately 275 feet below sea level at the lowest point in the Salton Trough to 2700 feet along low northwest to southeast trending mountain ranges. The average annual precipitation is 2 to 6 inches with high temporal and spatial variability. Winter temperatures are mild, summer temperatures are hot, and seasonal and diurnal temperature fluctuations are large. Monthly minimum temperature averages range from 40 to 80 degrees F (4 to 27 degrees C). Monthly maximum temperature averages range from 65 to 110 degrees F (18 to 43 degrees C) (WRCC 2002). Temperatures are rarely below 28 degrees F, and extremely rarely fall below 24 degrees F. Precipitation is bimodal, with approximately 20 to 40 percent of annual precipitation falling between July and September. This summer rainfall, in combination with very hot temperatures and very few to no days of hard freeze are what characterize this MLRA and distinguish it from the Mojave Desert (MLRA 30).

Classification relationships

NDDB/Holland, R.F. 1986. Preliminary descriptions of the terrestrial natural communities of California - Mojave Creosote Bush. Sawyer, J.O. and T. Keeler-Wolf. 1995. Manual of California Vegetation - Creosote bush-White bursage series.

Ecological site concept

This ecological site occurs on hills (and rarely on side slopes of fan remnants), predominately on north-facing aspects, at elevations of 1280 to 1800 feet. Slopes are typically 15 to 50 percent. Soils are very shallow with very gravelly loamy fine sand or very gravelly loamy sand surface textures, with a high cover of surface gravels, and similar subsurface textures.

Production reference value (RV) is 175 pounds per acre, and depending on precipitation and annual forb production, ranges from 100 to 250 pounds per acre. Sparse creosote bush (Larrea tridentata) and burrobush (Ambrosia dumosa) dominate the site.

Data ranges in the physiographic data, climate data, water features, and soil data sections of this Ecological Site Description are based on major components only (15 percent of mapunit or greater).

Similar sites

R030XD001CA	**Hyperthermic Dry Hills** This ecological site occurs in the Mojave Desert on hyperthermic soils. It has higher production.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Larrea tridentata* (2) *Ambrosia dumosa*
Herbaceous	(1) *Plantago ovata*

Physiographic features

This site occurs predominately on north-facing sideslopes of low hills and mountains. Slopes may range from 8 to 50 percent, but slope gradients from 15 to 50 percent are most typical.

Table 2. Representative physiographic features

Landforms	(1) Hill
Elevation	1,280–1,800 ft
Slope	8–50%
Aspect	N, NE, NW

Climatic features

The Colorado Desert of California represents the northwestern most portion of the Sonoran Desert. The subtropical Colorado Desert results from the descent of cold air which is heated by compression and arrives hot and dry at the earth's surface. Precipitation is frontal in nature during the winter and convectional in the summer. Reduced summer rainfall and high potential evapotranspiration make the Colorado Desert one of the most arid areas in North America. Summer temperatures frequently reach 110 degrees F. The average annual precipitation ranges from 2 to 4 inches with most falling as rain. Snowfall is rare. Approximately 35% of annual precipitation occurs from July to September as a result of intense convection storms. Spring months are the windiest.

Table 3. Representative climatic features

Frost-free period (average)	365 days
Freeze-free period (average)	365 days
Precipitation total (average)	6 in

Influencing water features

Soil features

The soils on this site are very shallow and shallow, and formed in residuum and colluvium from granitic or andesitic sources. Although not typical, this site is may also be associated with minor components of very deep soils on sideslopes of fan remnants. These soils are loamy-skeletal in the particle size control section, and permeability is moderate to moderately rapid. Surface textures include very gravelly loamy fine sand to very gravelly sandy loam (minor component with gravelly loamy coarse sand), with similar subsurface textures. Surface gravels (< 3 mm in diameter) range from 70 to 85 percent, and larger fragments range from 0 to 11 percent. Subsurface gravels by volume (for a depth of 0 to 59 inches) range from 45 to 70 percent and larger fragments by volume range from 0 to 6 percent.

This ecological site is associated with the following soils as major components: Stormjade (loamy-skeletal, mixed, superactive, calcareous, hyperthermic, shallow Typic Torriorthents); Sunrock (loamy-skeletal, mixed, superactive,

hyperthermic Lithic Haplargids), and Whipple (loamy-skeletal, mixed, superactive, calcareous, hyperthermic Lithic Torriorthents). The Rizzo soils (sandy-skeletal, mixed, hyperthermic Typic Torriorthents) are associated as a minor component with this ecological site, and are uncommon for this ecological site. They are very deep alluvial soils on steep sideslopes of fan remnants with the same vegetation as the hillslope counterparts.

NOTE: The Sunrock soil is incorrectly linked in the CA803 (Colorado Desert Survey) Chemehuevi Wash OHV area. The Sunrock soil is a MLRA 30 soil (Mojave desert) and needs to be developed as a MLRA 31 (Colorado Desert) soil.

This ecological site is correlated with the following map units and soil components in the Colorado Desert Soil Survey (CA803):

Mapunit; mapunit name; Component; Phase; Percent

1211; Stormjade-Whipple complex, 8 to 50 percent slopes; Stormjade; dry; 40 and Whipple; ; 30
1401; Sunrock-Cheme family association, 8 to 50 percent slopes; Sunrock; cobbly, moist; 7
1402; Sunrock-Cheme family-Rock outcrop association, 8 to 50 percent slopes; Sunrock; moist; 40, and Whipple; ; 5
2408; Rizzo complex, 2 to 8 percent slopes; Rizzo;strongly sloping;3
2440; Rizzo complex, 8 to 15 percent slopes; Rizzo; steep; 10

This ecological site is correlated with the following map units and soil components in the Joshua Tree National Park Soil Survey (CA794):

2408; Rizzo complex, 2 to 8 percent slopes; Rizzo;strongly sloping; 3
2440; Rizzo complex, 8 to 15 percent slopes; Rizzo; steep; 10

Table 4. Representative soil features

Parent material	(1) Colluvium–granite (2) Residuum–andesite
Surface texture	(1) Very gravelly loamy fine sand (2) Very gravelly sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderate to rapid
Soil depth	4–20 in
Surface fragment cover <=3"	70–85%
Surface fragment cover >3"	0–11%
Available water capacity (0-40in)	0.2–0.6 in
Calcium carbonate equivalent (0-40in)	1–10%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–4
Soil reaction (1:1 water) (0-40in)	6.6–8
Subsurface fragment volume <=3" (Depth not specified)	45–70%
Subsurface fragment volume >3" (Depth not specified)	0–6%

Ecological dynamics

Abiotic Factors

The most important abiotic factors driving this site are relatively cool landform positions in a hot climate with hyperthermic soil temperatures, steep slopes and skeletal soils. North-facing slope positions retain higher soil moisture availability during the winter and spring wet period, which allows the shallow-rooted burrobush to persist on the hyperthermic coarse soils of this ecological site. Cool winter soil temperatures restrict brittlebush (*Encelia farinosa*), which is dominant on adjacent south-facing slopes (Martre et al. 2002).

Steeper slopes experience greater degrees of water stress (Monson et al. 1992, Martre et al. 2002), and shallow skeletal soils have little water holding capacity. Creosote bush is a very long-lived, deep-rooted evergreen shrub that tends to be associated with coarse textured soils with little horizon development, and reaches greatest biomass and age on deep soils with large deep water reserves (McAuliffe 1994, Hamerlynk et al. 2002, Hamerlynk and McAuliffe 2008). On steep slopes, biomass and age are limited by erosional processes that cause shrub mortality, and by reduced deep soil water availability. Burrobush is a relatively short-lived, shallow-rooted, drought-deciduous shrub. It reaches greatest abundance on shallow soils, or soils with a high degree of horizon development that reduces water infiltration (Hamerlynk et al. 2002; Hamerlynk and McAuliffe 2008). The coarse soils of this ecological site do not retain water, but in the generally shallow soils of this ecological site, burrobush can access shallow water available at the soil – bedrock boundary during winter months.

Disturbance Dynamics

The disturbances impacting this ecological site include drought, invasion by non-native species and fire.

Desert regions are characterized by low mean annual precipitation and extreme variability in the amount of precipitation received in any year or decade (Hereford et al. 2006). Thus, episodic mortality in response to periods of drought is important in shaping desert community dynamics (Hereford et al. 2006, Miriti et al. 2007). Short-lived perennial shrubs 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 and trees 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.

The hot temperatures and skeletal soils of this ecological site reduce available soil moisture, which limits the susceptibility of this site to invasion by non-native annuals. However, microsites that are sheltered by large rock fragments and/or that receive additional run-on are susceptible to invasion by non-native annuals including red-stemmed stork's bill (Erodium cicutarum), red brome (*Bromus rubens*), and Mediterranean grass (*Schismus barbatus*). These non-native annuals may usurp space from native annuals that also depend on these microsites for establishment.

The low potential for high biomass of annual species limits the continuity of fine fuels in this site, and reduces the susceptibility of this site to fire. However, during very wet years native annuals may reach high biomass, and since this site occurs on steep slopes over which fire may rapidly move, this site may burn during conditions of extreme fire behavior. In the rare event that this ecological site does burn, a burrobush dominated community recovers relatively rapidly, and although creosote bush communities may take decades to recover to pre-burn stature (Brown and Minnich 1986, Engel and Abella 2011), the vast expanse of the creosote seedbank on surrounding landforms means that this ecological site is not considered at risk of transitioning to a fire-altered State.

State and transition model

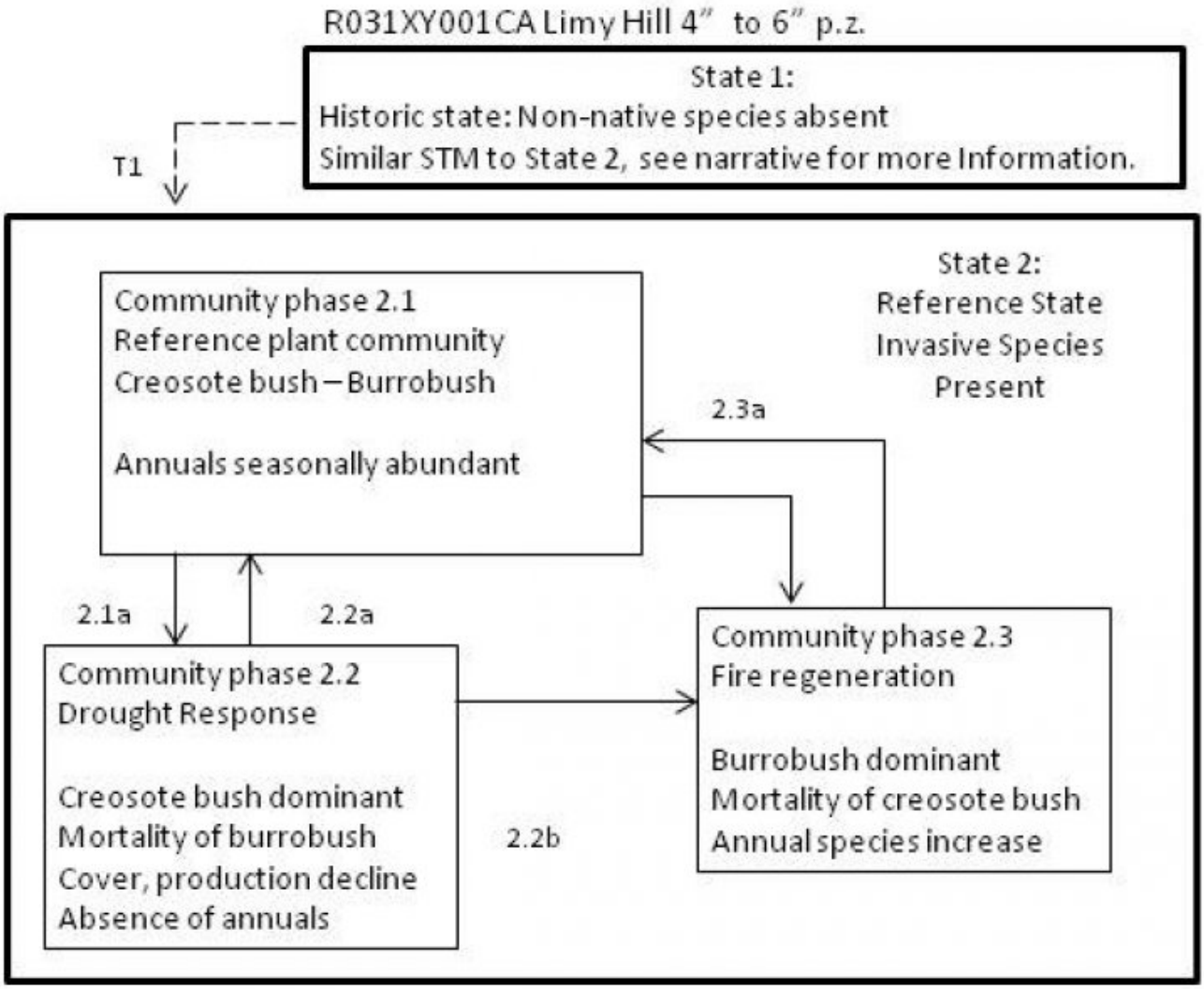

Figure 3. R031XY001CA Model

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 and Colorado Deserts. Drought and very rare fire were the natural disturbances influencing this ecological site. Data for this State does not exist, but it would have been similar to State 2, except with only native species present. See State 2 narrative for more detailed information.

State 2
Reference State

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

Community 2.1
Reference Community

Figure 4. Reference Community

The reference community is characterized by widely spaced shrubs, 0.5 to 2 meters tall. Creosote bush and burrobush dominate. Brittlebush (*Encelia farinosa*) is occasionally present, and the cacti strawberry cactus (*Mammillaria dioica*) and beavertail pricklypear (*Opuntia basilaris*) are often present. Forbs are more common in years of high precipitation, but desert Indianwheat (*Plantago ovata*) is present in most years. Native annual and perennial grasses are present with low cover and production and include desert low woollygrass (*Dasyochloa pulchella*), sixweeks threeawn (*Aristida adscensionis*), and sixweeks grama (*Bouteloua barbata*). The non-native Mediterranean grass (Schismus spp.) is present with low cover.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	99	172	240
Forb	1	3	5
Grass/Grasslike	0	0	5
Total	**100**	**175**	**250**

Table 6. Ground cover

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

Table 7. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	7-10%
Grass/grasslike basal cover	0%

Forb basal cover	1-2%
Non-vascular plants	0%
Biological crusts	0%
Litter	3-5%
Surface fragments >0.25" and <=3"	85-90%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	1-2%

Table 8. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	–	2-3%
>0.5 <= 1	–	–	–	–
>1 <= 2	–	3-5%	–	–
>2 <= 4.5	–	5-7%	–	–
>4.5 <= 13	–	3-5%	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Community 2.2
Drought Response

This community phase is characterized by an overall decline in cover due branch-pruning and lack of recruitment of creosote bush, mortality of burrobush, and lack of emergence of annual forbs.

Community 2.3
Post-fire Regeneration

This community phase is characterized by the loss of creosote bush from the plant community, since creosote bush is typically killed by fire (Brown and Minnich 1986). Burrobush has limited sprouting ability following fire, but relatively rapidly colonizes disturbed areas from adjacent seed sources, and will dominate the fire regeneration community. Native annual forbs will also increase. By 19-20 years post-fire there is sparse cover of creosote bush and other secondary shrubs in burned communities (Engel and Abella 2011, Steers and Allen 2011).

Pathway 2.1a
Community 2.1 to 2.2

This pathway occurs with prolonged or severe drought.

Pathway 2.1b
Community 2.1 to 2.2

This pathway occurs with moderate to severe fire.

Pathway 2.2a

Community 2.2 to 2.1

This pathway occurs with time and a return to average or above average climatic conditions.

Pathway 2.2b
Community 2.2 to 2.3

This pathway occurs with moderate to severe fire, and takes place within one years of a very wet period when standing native forb biomass is still present.

Pathway 2.3a
Community 2.3 to 2.1

This community pathway occurs with time and an absence of additional disturbance.

Additional community tables

Table 9. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
1	**Native Shrubs**			99–240	
	creosote bush	LATR2	*Larrea tridentata*	58–140	–
	burrobush	AMDU2	*Ambrosia dumosa*	30–72	–
	brittlebush	ENFA	*Encelia farinosa*	9–22	–
	strawberry cactus	MADI3	*Mammillaria dioica*	1–3	–
	beavertail pricklypear	OPBA2	*Opuntia basilaris*	1–3	–
Forb					
2	**Forbs**			1–5	
	desert Indianwheat	PLOV	*Plantago ovata*	1–5	–
Grass/Grasslike					
3	**Perennial Grasses**			0–3	
	low woollygrass	DAPU7	*Dasyochloa pulchella*	0–3	–
4	**Annual Grasses**			0–2	
	sixweeks threeawn	ARAD	*Aristida adscensionis*	0–1	–
	sixweeks grama	BOBA2	*Bouteloua barbata*	0–1	–
5	**Non-native grass**			0–3	
	Mediterranean grass	SCHIS	*Schismus*	0–3	–

Animal community

This site is dominated by two shrubs highly values by burrowing animals, creosote bush and burrobush. Desert tortoise (Gopherus agassizii), lizards, ground squirrels and other rodents all make burrows in the root-mounds of the creosote bush. The medium stature of creosote also allows for some perching by both birds and rodents. The partially shaded apron around the creosote bush is more nutrient rich than surrounding areas and gives rise to abundant annual plants when rainfall allows. This then provides a food source for the above-mentioned wildlife. Burrobush, although not as well suited as creosote, also provides good burrowing among its roots and provides good cover from predators.

Recreational uses

This site is highly valued for open space and those interested in desert ecology. Uses include mountain biking, hiking, bird watching and botanizing. Desert tortoise and wildflowers may also attract visitors during the spring.

Type locality

Location 1: San Bernardino County, CA	
UTM zone	N
UTM northing	3813958
UTM easting	733375
Latitude	34° 26′ 26″
Longitude	114° 27′ 35″
General legal description	This site is located several miles east from West Well on the powerline road in Chemehuevi Wash OHV area.

Other references

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Steers, R. J. and E. B. Allen. 2011. Fire effects on perennial vegetation in the western Colorado Desert, USA. Fire Ecology 7:59-74.

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Contributors

Marchel Munnecke
Patti Novak-Echenique / Heath McAllister

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	11/13/2024
Approved by	Curtis Talbot
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):**

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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):**

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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:

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

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

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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:**