Ecological site R019XI101CA
Sandy dunes 13-34" p.z.

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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.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Lupinus albifrons*
Herbaceous	(1) *Abronia maritima* (2) *Abronia umbellata*

Physiographic features

This ecological site is found on all aspects of coastal beaches and dunes. Slopes range from 0 to 25 percent, with elevations from approximately 3 feet above sea level to just above 300 feet.

Table 2. Representative physiographic features

Landforms	(1) Beach (2) Dune
Elevation	1–95 m
Slope	0–25%
Aspect	Aspect is not a significant factor

Climatic features

This ecological site is found on three of the five northern Channel Islands, Santa Cruz, Santa Rosa, and San Miguel. Each island has a different temperature and precipitation range, however for the purposes of this description, they have all been added together to capture the entire range of variance.

The average annual precipitation is around 26 to 29 inches with a range between 13 and 34 inches, mostly from rain in the winter months (November through April). The average annual air temperature is approximately 56 to 73 degrees Fahrenheit, and the frost-free season (>32F) is 320 to 365 days.

NOTE: Data collected for monthly precipitation and temperatures has been averaged between all three islands, and is only from one climate station/island, therefore may not capture the variance in climates on each of the five islands.

Table 3. Representative climatic features

Frost-free period (average)	365 days
Freeze-free period (average)	365 days
Precipitation total (average)	864 mm

Influencing water features

Soil features

These soils are found on beach dunes and are weakly developed. The dunes have formed from Eolian sands derived from volcanic and sedimentary rock. The soils are deep to very deep, with textures of loamy sand throughout. The mean annual soil temperatures (MAST) range from 59 to 71 degrees F, and are all classified as thermic. The available water capacity is low at approximately 2.8 inches, and the soils are somewhat excessively drained.

This ecological site is found in the following Map units and soil components:

SSA Map unit Component

CA688 160 Abaft
CA688 650 Abaft
CA688 651 Abaft
CA688 651 Abaft moderately steep
CA688 970 Dune land

Table 4. Representative soil features

Surface texture	(1) Loamy sand
Family particle size	(1) Sandy
Drainage class	Somewhat excessively drained
Permeability class	Rapid
Soil depth	0–203 cm
Available water capacity (0-101.6cm)	7.11 cm
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.6–7.3

Ecological dynamics

This ecological site includes the beaches and sand dunes that are found around the perimeter of the Channel Islands and older dunes on marine terraces. The dunes are in a constant cycle of change. The cycle begins with barren dunes and actively moving sand. Next, the dunes will begin to stabilize as the dune vegetation establishes a root system. This root system protects the soil from wind and water erosion. As the vegetation grows, the protected soil surface becomes suitable for shrub species that have deeper rooting structures, which will then work to make the site more stable and protected. Eventually, the growth of vegetation and continued protection will create a site that is a fully stabilized duneland with very little exposed sand.

Most of the site area has been stabilized by vegetation for many centuries. Large amounts of eolian sands were deposited on the marine terraces during the Pleistocene, when the ocean levels were much lower than today. In the case of San Miguel Island, the area of active bare sand dunes was greatly increased due to heavy grazing during

the 1800s. Aerial photographs show the slow process of re-vegetation and stabilization of the sand dunes since the disturbances have been removed.

Dune stabilization is often towards the inland side of the dune system, sometimes called backdunes. Salt-tolerant species such as silver lupine (*Lupinus albifrons*), inland saltgrass (*Distichlis spicata*), Menzies goldenbush (*Isocoma menziesii*), coyotebrush (*Baccharis pilularis*), and San Miguel milkvetch (*Astragalus miguelensis*) dominate. In many areas, the non-native grasses, such as oats (Avena ssp.) and bromes (Bromus spp.) have established.

In areas of barren dunes, the sands are actively moving due to direct exposure to wind, and consequently very little grows on them. Along the edge of active dunes, or above the hightide lines, the vegetation begins to slow the movement of sand. This area is often called the beach, or active coastal dune community, which intergrades into the beach foredunes. The primary native dune stabilizers are sticky sand verbena (*Abronia maritima*), pink sand verbena (Abronia umbellate), silver beach bur (*Ambrosia chamissonis*), Sea scale (*Atriplex leucophylla*), and beach suncup (*Camissonia cheiranthifolia* ssp. cheiranthifolia). Non-native dune plants include crystalline iceplant (*Mesembryanthemum crystallinum*), slender-leaved ice-plant (*M. nodiflorum*), Sea fig (*Carpobrotus chilensis*), and scarlet pimpernel (*Anagallis arvensis*). Several other plant species are also present.

State and transition model

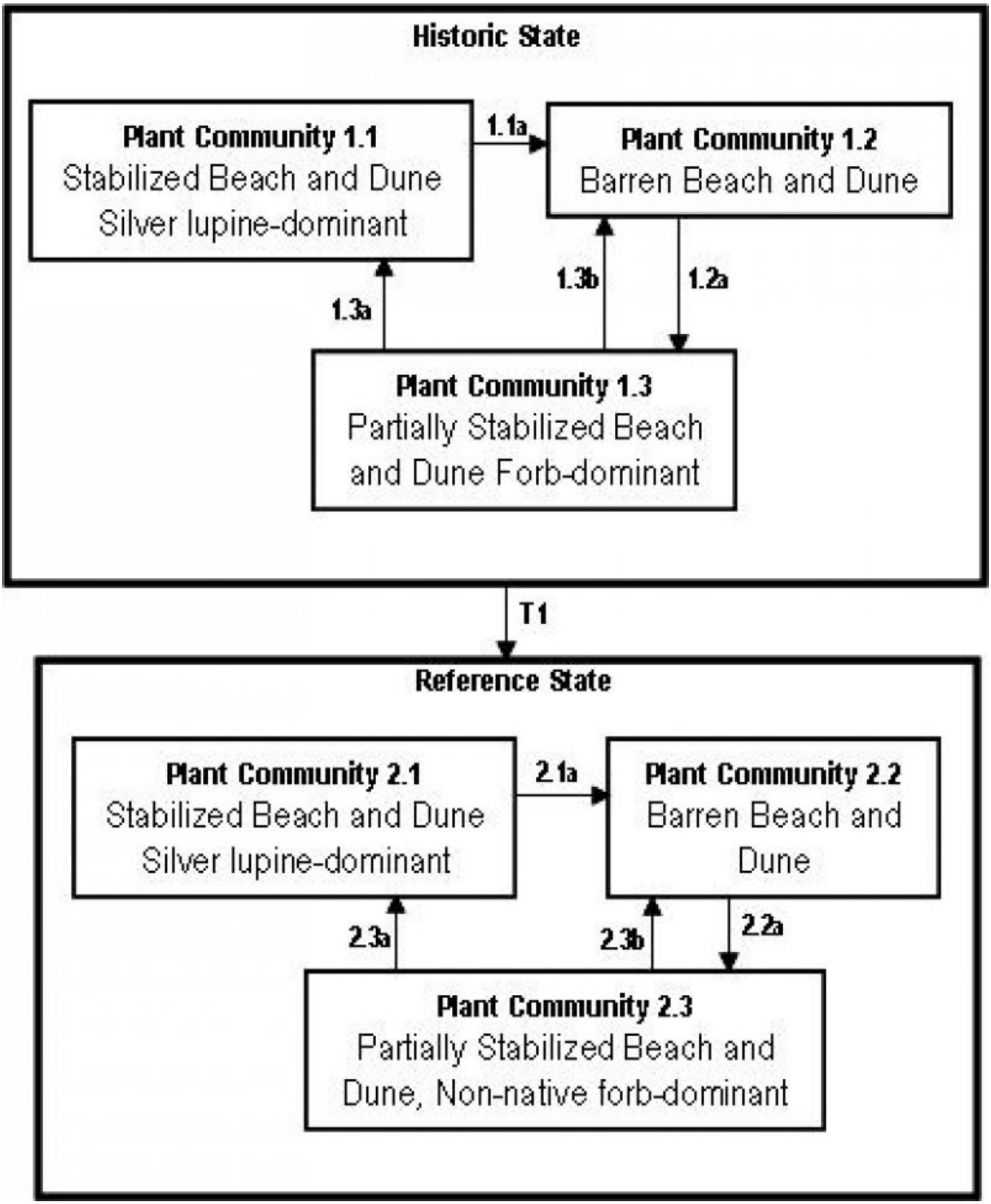

Figure 3. State transition Model

State 1
Plant Community 2.3

Community 1.1
Plant Community 2.3

This state is dominated primarily by non-native forbs including common iceplant (*Mesembryanthemum crystallinum*), slenderleaf iceplant (*Mesembryanthemum nodiflorum*) and scarlet pimpernel (*Anagallis arvensis*). These species are extremely salt-tolerant and act as primary stabilizers for the site. Because they are non-native and reasonably aggressive species, they may be able to out-compete the native shrubs that would otherwise move in naturally as the site becomes more stable. This could leave the site perpetually in PC 2.3. Community Pathway 2.3a: The shift from PC 2.3 to PC 2.1 occurs as the beaches and dunes become more stable. This stability may allow silver lupine to reestablish, as long as the iceplants have not created conditions that make it difficult for lupine germination and establishment. Other species that will begin to grow include yellow bush lupine, Menzies goldenbush and coyotebrush. As these species become well-established, the iceplants will be prevalent only in the areas that remain somewhat unstable and unsuitable for encroachment by the shrub species. Community Pathway 2.3 b: PC 2.3 may shift back to PC 2.2 if a wind storm or water disturbance removes the shrubs that have not yet fully established in the site. Higher than normal tides that may drown young root systems or wind storms that deposit large amounts of sand can bury the plants too deep for recovery.

State 2
Plant Community 1.2

Community 2.1
Plant Community 1.2

This plant community is comprised of mostly barren areas of sand that has been deposited by wind or water. These dunes are actively moving due to the wind and will change form depending on the direction this wind is blowing. Consequently, very little grows on these dunes. Community Pathway 1.2a: The shift from PC 1.2 to PC 1.3 occurs as the native, salt-tolerant forbs and grasses begin to establish on the barren dunes. Transition 1: All of the plant communities within the historic state can transition to the reference state if there is extensive, unmanaged grazing by large numbers of domestic livestock or an invasion of non-native plant species. The plant species found on the beaches and dunes did not evolve with grazing and are not physiologically adapted to chronic severe defoliation, which could eventually kill the plants entirely. Note: No data was collected for the plant community.

State 3
Reference State - Plant Community 2.1

Community 3.1
Reference State - Plant Community 2.1

The reference state is similar to the historic state, and is dominated almost entirely by silver lupine (*Lupinus albifrons*). Unlike the historic state, this plant community has an understory dominated by non-native iceplants and ripgut brome (Bromus rigidus) that have invaded the site. Other species that can be found in this community include coyotebrush (*Baccharis pilularis*), yellow bush lupine (*Lupinus arboreus*), Menzies goldenbush (*Isocoma menziesii* var. sedoides), San Miguel milkvetch (*Astragalus miguelensis*), inland saltgrass (*Distichlis spicata*), red sand verbena (Abronia maritime), and pink sand verbena (abronia umbellate). Community Pathway 2.1a: The shift from PC 2.1 to PC 2.2 occurs under both natural and non-natural disturbances. The natural disturbance regime of coastal beaches is wind and water disturbance, which causes patches of disturbance that can affect small or large areas. Large waves would uproot the lupines and forbs, and deposit large amounts of sand on top of the uprooted plants. Wind can also create this transition if it is continually depositing sand on top of the existing vegetation to the extent that it is buried and can no longer perform normal plant functions. This shift can also occur if there is extensive, unmanaged grazing by large numbers of domestic livestock or an increased invasion of non-native plant species. The plant species found on the beaches and dunes did not evolve with grazing and are not physiologically adapted to chronic severe defoliation, which could eventually kill the plants entirely.

State 4
Plant Community 1.3

Community 4.1
Plant Community 1.3

This state is dominated primarily by red sand verbena (Abronia maritime) and pink sand verbena (Abronia umbellate). These species are extremely salt-tolerant and act as the primary stabilizers for the site. Community Pathway 1.3a: The shift from PC 1.3 to PC 1.1 occurs as the beaches and dunes become more stable, providing proper conditions for germination and establishment of silver lupine. Other species that will begin to establish include yellow bush lupine, Menzies goldenbush and coyotebrush. As these species become well-established, the sand verbenas will be prevalent only in the areas that remain somewhat unstable and unsuitable for encroachment by the shrub species. Community Pathway 1.3 b: PC 1.3 may shift back to PC 1.2 if a wind storm or water disturbance removes the shrubs that have not yet fully established in the site. Higher than normal tides that may drown young root systems or wind storms that deposit large amounts of sand can bury the plants too deep for recovery. Transition 1: All of the plant communities within the historic state can transition to the reference state if there is extensive, unmanaged grazing by large numbers of domestic livestock or an invasion of non-native plant species. The plant species found on the beaches and dunes did not evolve with grazing and are not physiologically adapted to chronic severe defoliation, which could eventually kill the plants entirely. Note: No data was collected for the plant community.

State 5
Historic State- Plant Community 1.1

Community 5.1
Historic State- Plant Community 1.1

The historic state was dominated almost entirely by silver lupine (*Lupinus albifrons*). Other species that would have been found in this plant community include coyotebrush (*Baccharis pilularis*), yellow bush lupine (*Lupinus arboreus*), Menzies goldenbush (*Isocoma menziesii* var. sedoides), San Miguel milkvetch (*Astragalus miguelensis*), inland saltgrass (*Distichlis spicata*), red sand verbena (Abronia maritime), and pink sand verbena (abronia umbellate). Community Pathway 1.1a: The shift from PC 1.1 to PC 1.2 occurs under the natural disturbance regime of coastal beaches, which is wind and water disturbance. This is a patch disturbance and can affect small or large areas, depending on the type of water disturbance and the severity of the wind. Large waves would uproot the lupines and forbs and deposit large amounts of sand on top of the uprooted plants. Wind can also create this transition if it is continually depositing sand on top of the existing vegetation to the extent that it is buried and can no longer perform normal plant functions. Transition 1: All of the plant communities within the historic state can transition to the reference state if there is extensive, unmanaged grazing by large numbers of domestic livestock or an invasion of non-native plant species. The plant species found on the beaches and dunes did not evolve with grazing and are not physiologically adapted to chronic severe defoliation, which could eventually kill the plants entirely. Note: No data was collected for the plant community.

State 6
Plant Community 2.2

Community 6.1
Plant Community 2.2

This plant community is comprised of mostly barren areas of sand that have been deposited by wind or water. These dunes are actively moving due to the wind and will change form depending on the direction this wind is blowing. Consequently, very little grows on these dunes. This plant community can also be created by chronic severe defoliation by non-native livestock and wildlife on the islands. Community Pathway 2.2a: The shift from PC 2.2 to PC 2.3 occurs as the non-native, salt-tolerant forbs and grasses begin to establish on the barren dunes. Note: No data was collected for this plant community.

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Forb					
1	**forbs**			1	
	red sand verbena	ABMA2	*Abronia maritima*	1–112	–
	pink sand verbena	ABUM	*Abronia umbellata*	1	–
	silver bur ragweed	AMCH4	*Ambrosia chamissonis*	1	–
	beach saltbush	ATLE2	*Atriplex leucophylla*	1	–
	beach suncup	CACHC	*Camissonia cheiranthifolia ssp. cheiranthifolia*	1	–
	European searocket	CAMA	*Cakile maritima*	1	–
	saltgrass	DISP	*Distichlis spicata*	1	–
	Menzies' goldenbush	ISMES	*Isocoma menziesii var. sedoides*	1	–
	common iceplant	MECR3	*Mesembryanthemum crystallinum*	1	–
	slenderleaf iceplant	MENO2	*Mesembryanthemum nodiflorum*	1	–
Grass/Grasslike					
2	**grasses**			1	
	oat	AVENA	*Avena*	1	–
	brome	BROMU	*Bromus*	1	–

Table 6. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
1	**shrubs**			1121–3363	
	silver lupine	LUAL4	*Lupinus albifrons*	1681–3363	–
	yellow bush lupine	LUAR	*Lupinus arboreus*	11–560	–
	coyotebrush	BAPI	*Baccharis pilularis*	11–112	–
	Menzies' goldenbush	ISME5	*Isocoma menziesii*	11–112	–
	San Miguel milkvetch	ASMI6	*Astragalus miguelensis*	1–56	–
Grass/Grasslike					
2	**grasses**			112–1121	
	saltgrass	DISP	*Distichlis spicata*	11–224	–
Forb					
3	**forbs**			56–2242	
	sea fig	CACH38	*Carpobrotus chilensis*	0–2242	–
	California goosefoot	CHCA3	*Chenopodium californicum*	22–336	–
	sand verbena	ABRON	*Abronia*	11–112	–
	cobwebby thistle	CIOC	*Cirsium occidentale*	1–34	–
	phacelia	PHACE	*Phacelia*	1–34	–
	Menzies' fiddleneck	AMME	*Amsinckia menziesii*	1–6	–

Animal community

This ecological site may be used as cover for birds, especially shorebirds, as well as small rodents and insects.

Hydrological functions

N/A

Recreational uses

This ecological site is located near the beach, making these dunes an area often frequented by tourists to the park. However, their lack of overall stability makes them unsuitable for any recreational uses.

Wood products

N/A

Other products

N/A

Inventory data references

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

SCV-108 % Site location.
SRV-4 Lbs
SM-9 %

Type locality

Location 1: Santa Barbara County, CA	
UTM zone	N
UTM northing	3767932
UTM easting	234157
General legal description	The site location is on Santa Cruz Island on Christi Beach.

Other references

Junak, Steve; Ayers, Tina; Scott, Randy; Wilken, Dieter; and Young, David (1995). A Flora of Santa Cruz Island. Santa Barbara Botanic Garden, Santa Barbara, CA.

Schoenherr, Allan A.; Feldmeth, Robert C.; and Ererson, Michael J. (1999). Natural History of the Islands of California. University of California Press., Berkeley and Las Angeles, California.

Slattery, Peter. Coastal Dunes. Monterey Bay National Marine Sanctuary Site Characterization, Section III.

Contributors

Munnecke

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:

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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:**
