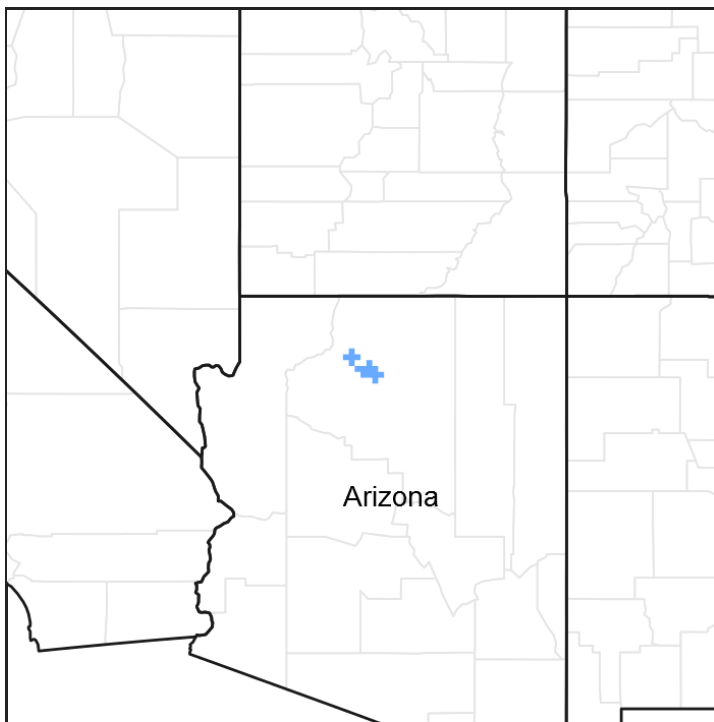


## Ecological site R035XE507AZ Limy Slopes 6-10" p.z.

Accessed: 05/20/2025

### 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

AZ CRA 35.5 – Grand Canyon Corridor

Elevations range from 1600 to 4500 feet and precipitation averages 6 to 10 inches per

year. Extreme elevation and aspect changes make this area unique. Vegetation includes Mormon tea, catclaw, white brittlebush, blackbrush, prickly pear, cholla species, big galleta, and blue threeawn. The soil temperature regime ranges from thermic to mesic and the soil moisture regime is typic aridic. This unit occurs within the Colorado Plateau Physiographic Province and is characterized by extreme vertical escarpments and strong aspect differences over short distances. Sedimentary rock classes dominate the Grand Canyon and exposures consist of a thick sequence of relatively undeformed formations.

## Associated sites

R035XE516AZ	<b>Sedimentary Cliffs 6-10" p.z.</b> Sedimentary Cliffs, 6-10" p.z. Cliff escarpments above and sometimes below the Limy Slopes ecological site.
R035XE517AZ	<b>Limy Slopes 6-10" p.z. Shallow</b> Limy Slopes, Shallow, 6-10" p.z. Sites with soils shallow to a petrocalcic horizon.

**Table 1. Dominant plant species**

Tree	Not specified
Shrub	(1) <i>Ephedra nevadensis</i>
Herbaceous	(1) <i>Pleuraphis jamesii</i> (2) <i>Bouteloua eriopoda</i>

## Physiographic features

The ecological site occurs on steep colluvial sideslopes and fan terraces of plateau escarpments and canyon sidewalls. Soils are moderately deep to deep; textures are sandy loam to loam and very gravelly and cobbly to bouldery. The soil surface is strongly to violently effervescent. This site occurs on all aspects. Water table depth is deep to very deep.

**Table 2. Representative physiographic features**

Landforms	(1) Fan (2) Terrace (3) Escarpment
Flooding frequency	None
Ponding frequency	None
Elevation	488–1,402 m
Slope	15–60%
Aspect	Aspect is not a significant factor

**Climatic features**

The climate of the land resource unit is arid to semiarid with warm summers and cool winters. The mean annual precipitation ranges from 6 – 10 inches, but it is very erratic, often varying substantially from year to year. The majority of the precipitation falls during the between October through May. This precipitation comes as gentile rain or occasionally snow from frontal storms coming out to the Pacific Ocean. Snow is infrequent and rarely last more than 1-2 days. The remaining precipitation comes from July through September as spotty, unreliable and sometimes violent thunderstorms. The moisture for this precipitation originates in the Gulf of Mexico (and the Pacific Ocean in the fall) and flows into the area on the north end of the Mexican monsoon. Late May through late June is generally a dry period. The mean annual air temperature ranges from 55 to 69 degrees Fahrenheit (F). The frost-free period (air temperature > 32 degrees F) ranges from 180 to 220 days (@ 50 percent probability).

**Table 3. Representative climatic features**

Frost-free period (average)	200 days
Freeze-free period (average)	220 days
Precipitation total (average)	254 mm

**Influencing water features**

**Soil features**

Soils on this ecological site are sandy loam to loam in texture, and very to extremely gravelly, cobbly and/or bouldery. They are strongly effervescent on the surface and approach being carbonatic in the control section. Soil depth is generally moderately deep to deep to bedrock, but the site may have some areas of shallow soils.

Soil temperature regime is typic thermic; moisture regime is aridic. Water erosion hazard is high; wind erosion hazard moderate.Soil pH range is 7.9-8.4.

Waterholding class is very low to low.

A typical soil profile is:

- A-0 to 2 inches; extremely cobbly loam; 45 perecent gravel, 20 percent cobble, and 10 percent stone; violently effervescent,
- C-1 to 10 inches; very cobbly loam; 25 percent gravel, 20 percent cobble, violently effervescent,
- C2-1- to 30 inches; extremely gravelly loam; 55 percent gravel, 10 percent cobble; violently effervescent,
- C3-30 to 60 inches extremely gravelly sandy loam; 55 percent gravel. 10 percent cobble;

violently effervescent.

Taxonomic classification of soils correlated to this ecological site include Loamy-skeletal, mixed, calcareous, mesic Lithic Torriorthents (Beraztic family soils); Loamy-skeletal, mixed, superactive, calcareous, mesic Typic Torriorthents (Cliffdown family soils); Loamy-skeletal, mixed, superactive, mesic Typic Haplocambide (Whirlo family soils); and Loamy-skeletal, carbonatic, mesic Typic Haplocalcids (Dera family soils).

Map units correlated to this site include:

SSA-701 Grand Canyon Area MU's 17 Typic haplocambids, 24 Cliffdown (family) & Cliffdown (family-moderately deep), 32 Whirlo (family), 34 Dera (family), 136 Typic haplocalcids and 159 Berzatic (family).

**Table 4. Representative soil features**

Parent material	(1) Alluvium–calcareous sandstone (2) Residuum–calcareous sandstone (3) Colluvium–limestone and sandstone
Surface texture	(1) Very cobbly sandy loam (2) Very gravelly loam (3) Bouldery silt loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Soil depth	51–152 cm
Surface fragment cover ≤3"	35–45%
Surface fragment cover >3"	15–30%
Available water capacity (0-101.6cm)	6.35–17.78 cm
Calcium carbonate equivalent (0-101.6cm)	15–40%
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)	7.9–8.4
Subsurface fragment volume ≤3" (Depth not specified)	5–55%

Subsurface fragment volume >3" (Depth not specified)	5–25%
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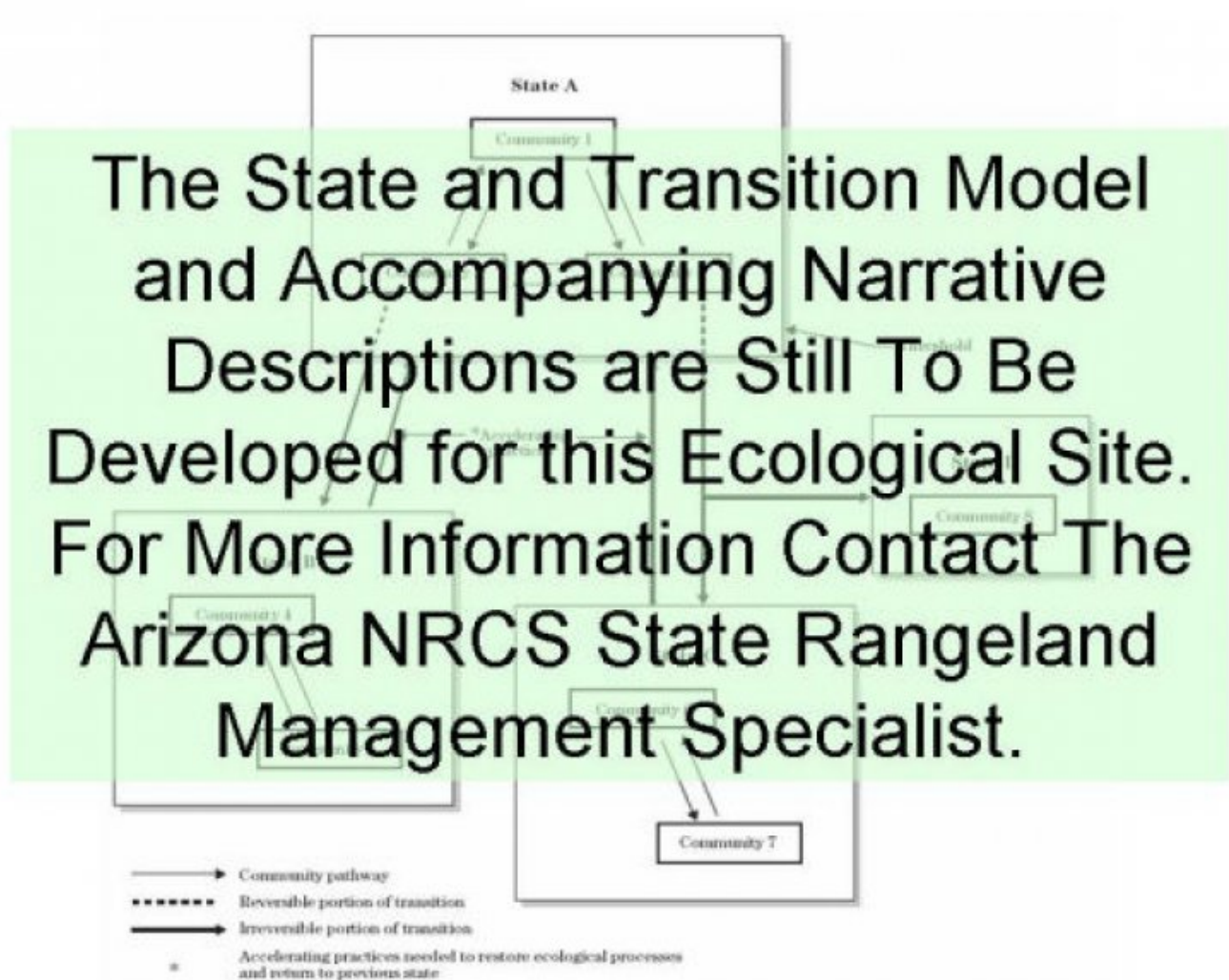
## Ecological dynamics

The plant communities found on an ecological site are naturally variable. Composition and production will vary with yearly conditions, location, aspect, and the natural variability of the soils. The historical climax plant community represents the natural potential plant communities found on relict or relatively undisturbed sites. Other plant communities described here represent plant communities that are known to occur when the site is disturbed by factors such as grazing, fire, or drought.

Production data provided in this site description is standardized to air-dry weight at the end of the summer growing season. The plant communities described in this site description are based on near normal rainfall years.

NRCS uses a Similarity Index to compare existing plant communities to the plant communities described here. Similarity Index is determined by comparing the production and composition of a plant community to the production and composition of a plant community described in this site description. To determine Similarity Index, compare the production (air-dry weight) of each species to that shown in the plant community description. For each species, count no more than the maximum amount shown for the species, and for each group, count no more than the maximum shown for the group. Divide the resulting total by the total normal year production shown in the plant community description. If rainfall has been significantly above or below normal, use the total production shown for above or below normal years. If field data is not collected at the end of the summer growing season, then the field data must be corrected to the end of the year production before comparing it to the site description. The growth curve can be used as a guide for estimating production at the end of the summer growing season.

## State and transition model



## State 1

### Historic Climax Plant Community

## Community 1.1

### Historic Climax Plant Community

This plant community has a large component of warm season perennial grasses; cool season perennial grasses are somewhat less abundant, but still significant. The plant community also has a significant shrub component. Blackbrush and ephedras can be fairly common, while a variety of other shrubs may be scattered across the site.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	269	303	336
Shrub/Vine	90	123	157
Forb	4	22	45
Tree	—	—	4
<b>Total</b>	<b>363</b>	<b>448</b>	<b>542</b>

Figure 5. Plant community growth curve (percent production by month). AZ3552, 35.5 6-10" p.z. upland sites. Growth begins in the spring and continues through the summer..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	8	18	19	11	14	20	8	2	0	0

## Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Common Native Perennial Summer Mid Grasses</b>			135–179	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	45–90	—
	black grama	BOER4	<i>Bouteloua eriopoda</i>	45–90	—
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	45–90	—
2	<b>Occasional Native Perennial Summer Mid Grasses</b>			22–45	
	bush muhly	MUPO2	<i>Muhlenbergia porteri</i>	6–22	—
	spike dropseed	SPCO4	<i>Sporobolus contractus</i>	6–22	—
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	6–22	—
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–11	—
	cane bluestem	BOBA3	<i>Bothriochloa barbinodis</i>	0–11	—
3	<b>Occasional Native Perennial Summer Short Grasses</b>			0–11	
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–9	—
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0–9	—
	low woollygrass	DAPU7	<i>Dasyochloa pulchella</i>	0–9	—
	nineawn	ENDE	<i>Enneapogon</i>	0–9	—

	pappusgrass		<i>desvauxii</i>		
	shortleaf woollygrass	ERAV	<i>Erioneuron avenaceum</i>	0–9	–
	Hall's panicgrass	PAHA	<i>Panicum hallii</i>	0–9	–
	burrograss	SCBR2	<i>Scleropogon brevifolius</i>	0–9	–
4	<b>Common Native Perennial Spring Mid Grasses</b>			45–90	
	desert needlegrass	ACSP12	<i>Achnatherum speciosum</i>	22–45	–
	blue threeawn	ARPUN	<i>Aristida purpurea</i> var. <i>nealleyi</i>	6–22	–
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	6–22	–
	New Mexico feathergrass	HENE5	<i>Hesperostipa neomexicana</i>	6–22	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	6–22	–
5	<b>Occasional Native Perennial Spring Mid Grasses</b>			0–11	
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–9	–
	squirreltail	ELELE	<i>Elymus elymoides</i> ssp. <i>elymoides</i>	0–9	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–9	–
6	<b>Occasional Native Annual Grasses</b>			0–11	
	Grass, annual	2GA	<i>Grass, annual</i>	0–9	–
	Wright's threeawn	ARPUW	<i>Aristida purpurea</i> var. <i>wrightii</i>	0–9	–
	sixweeks grama	BOBA2	<i>Bouteloua barbata</i>	0–9	–
<b>Forb</b>					
7	<b>Occasional Native Perennial Spring Short Forbs</b>			6–22	
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–13	–
	perennial rockcress	ARPE2	<i>Arabis perennans</i>	0–13	–
	lipfern	CHEIL	<i>Cheilanthes</i>	0–13	–
	rose heath	CHER2	<i>Chaetopappa ericoides</i>	0–13	–
	desert trumpet	ERIN4	<i>Eriogonum inflatum</i>	0–13	–
	globemallow	SPHAE	<i>Sphaeralcea</i>	0–13	–
8	<b>Occasional Native Perennial Summer Short Forbs</b>			6–22	
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–13	–

	fireweed	CHAME2	<i>Chamerion</i>	0–13	–
	spurge	EUPHO	<i>Euphorbia</i>	0–13	–
	twinevine	FUNAS	<i>Funastrum</i>	0–13	–
	Colorado four o'clock	MIMU	<i>Mirabilis multiflora</i>	0–13	–
	beardtongue	PENST	<i>Penstemon</i>	0–13	–
	brownplume wirelettuce	STPA4	<i>Stephanomeria pauciflora</i>	0–13	–
	longstalk greenthread	THLO	<i>Thelesperma longipes</i>	0–13	–
9	<b>Occasional Native Annual Forbs</b>			0–11	
	Forb, annual	2FA	<i>Forb, annual</i>	0–9	–
	sagebrush	ARTEM	<i>Artemisia</i>	0–9	–
	milkvetch	ASTRA	<i>Astragalus</i>	0–9	–
	cryptantha	CRYPT	<i>Cryptantha</i>	0–9	–
	fleabane	ERIGE2	<i>Erigeron</i>	0–9	–
	spurge	EUPHO	<i>Euphorbia</i>	0–9	–
	popcornflower	PLAGI	<i>Plagiobothrys</i>	0–9	–
	desert Indianwheat	PLOV	<i>Plantago ovata</i>	0–9	–
<b>Shrub/Vine</b>					
10	<b>Occasional Native Half Shrubs</b>			0–11	
	Shrub, other	2S	<i>Shrub, other</i>	0–11	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0–11	–
	Eastern Mojave buckwheat	ERFA2	<i>Eriogonum fasciculatum</i>	0–11	–
	bastardsage	ERWR	<i>Eriogonum wrightii</i>	0–11	–
	bedstraw	GALIU	<i>Galium</i>	0–11	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–11	–
	desert princesplume	STPI	<i>Stanleya pinnata</i>	0–11	–
	pricklyleaf dogweed	THAC	<i>Thymophylla acerosa</i>	0–11	–
	turpentinebroom	THMO	<i>Thamnosma montana</i>	0–11	–
	goldeneye	VIGUI	<i>Viguiera</i>	0–11	–
	Mojave woodyaster	XYTO2	<i>Xylorhiza tortifolia</i>	0–11	–
11	<b>Common Native Mid Shrubs</b>			22–45	
	blackbrush	CORA	<i>Coleogyne ramosissima</i>	6–45	–
	Nevada jojoba	ERNE	<i>Ephedra nevadensis</i>	0–22	–

	Nevada jointfir	EPNE	<i>Ephedra nevadensis</i>	0–22	–
	mormon tea	EPVI	<i>Ephedra viridis</i>	6–22	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	6–22	–
12	<b>Occasional Native Mid Shrubs</b>			22–67	
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	0–11	–
	mouse's eye	BEMY	<i>Bernardia myricifolia</i>	0–11	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0–11	–
	mariola	PAIN2	<i>Parthenium incanum</i>	0–11	–
	Sonoran scrub oak	QUTU2	<i>Quercus turbinella</i>	0–9	–
	purple sage	SADO4	<i>Salvia dorrii</i>	0–9	–
	brittlebush	ENFA	<i>Encelia farinosa</i>	0–9	–
	button brittlebush	ENFR	<i>Encelia frutescens</i>	0–9	–
	crispleaf buckwheat	ERCO14	<i>Eriogonum corymbosum</i>	0–9	–
	Apache plume	FAPA	<i>Fallugia paradoxa</i>	0–9	–
	Arizona desert-thorn	LYEX	<i>Lycium exsertum</i>	0–9	–
	catclaw acacia	ACGR	<i>Acacia greggii</i>	0–9	–
	Wright's beebrush	ALWR	<i>Aloysia wrightii</i>	0–9	–
13	<b>Occasional Native Cacti</b>			6–22	
	Whipple cholla	CYWH	<i>Cylindropuntia whipplei</i>	0–11	–
	beavertail pricklypear	OPBA2	<i>Opuntia basilaris</i>	0–11	–
	cactus apple	OPEN3	<i>Opuntia engelmannii</i>	0–11	–
	tulip pricklypear	OPPH	<i>Opuntia phaeacantha</i>	0–11	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0–11	–
	grizzlybear pricklypear	OPPOE	<i>Opuntia polyacantha var. erinacea</i>	0–11	–
	Engelmann's hedgehog cactus	ECEN	<i>Echinocereus engelmannii</i>	0–4	–
	cottontop cactus	ECPO2	<i>Echinocactus polycephalus</i>	0–4	–
	California barrel cactus	FECY	<i>Ferocactus cylindraceus</i>	0–4	–
14	<b>Occasional Native Agave-Yucca-Like</b>			0–6	
	Utah agave	AGUT	<i>Agave utahensis</i>	0–4	–
	banana yucca	YUBA	<i>Yucca baccata</i>	0–4	–
<b>Tree</b>					

14	<b>Occasional Native Trees</b>			0–6	
	California redbud	CEOR9	<i>Cercis orbiculata</i>	0–4	–
	Utah juniper	JUOS	<i>Juniperus osteosperma</i>	0–4	–
	twoneedle pinyon	PIED	<i>Pinus edulis</i>	0–4	–
	pallid hoptree	PTTRP	<i>Ptelea trifoliata</i> ssp. <i>pallida</i>	0–4	–

## Type locality

Location 1: Coconino County, AZ	
Latitude	36° 10' 8"
Longitude	112° 2' 30"
General legal description	Type location of Cliffdown families soil. In Bright Angel Canyon; 267 feet southwest of Cottonwood Camp.
Location 2: Coconino County, AZ	
Latitude	36° 4' 53"
Longitude	112° 7' 32"
General legal description	Type location for Whirlo family soils. On the Tonto Platform; 1,876 feet southwest of Indian Garden.
Location 3: Coconino County, AZ	
Latitude	36° 4' 55"
Longitude	112° 6' 41"
General legal description	Type location for Dera family soils. On the Tonto Platform; 2776 feet northeast of Indian Garden.
Location 4: Coconino County, AZ	
Latitude	36° 9' 20"
Longitude	112° 2' 55"
General legal description	Type location for Berzatic family soils. In Bright Angel Canyon; 2173 feet northeast of Ribbon Falls.

## Contributors

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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:

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### 4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):

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### 5. Number of gullies and erosion associated with gullies:

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### 6. Extent of wind scoured, blowouts and/or depositional areas:

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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):**

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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:**

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