

Ecological site R028AY308UT

Upland Gravelly Loam (Singleleaf Pinyon-Utah Juniper)

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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.

MLRA notes

Major Land Resource Area (MLRA): 028A–Ancient Lake Bonneville

MLRA 28A occurs in Utah (82 percent), Nevada (16 percent), and Idaho (2 percent). It encompasses approximately 36,775 square miles (95,246 square kilometers). A large area west and southwest of Great Salt Lake is a salty playa. This area is the farthest eastern extent of the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. It is an area of nearly level basins between widely separated mountain ranges trending north to south. The basins are bordered by long, gently sloping alluvial fans. The mountains are uplifted fault blocks with steep side slopes. Most of the valleys are closed basins containing sinks or playa lakes. Elevation ranges from 3,950 to 6,560 feet (1,204 to 2000 meters) in the basins and from 6,560 to 11,150 feet (1996 to 3398 meters) in the mountains. Much of the MLRA has alluvial valley fill and playa lakebed deposits at the surface from pluvial Lake Bonneville, which dominated this MLRA 13,000 years ago. A level line of remnant lake terraces on some mountain slopes indicates the former extent of this glacial lake. The Great Salt Lake is what remains of the pluvial lake. Mountains in the interior of this MLRA consist of tilted blocks of marine sediments from Cambrian to Mississippian age with scattered outcrops of Tertiary continental sediments and volcanic rocks. The average annual precipitation is 5 to 12 inches (13 to 30 cm) in the valleys and ranges up to 49 inches (124 cm) in the mountains. Most of the rainfall in the southern LRU occurs as high-intensity, convective thunderstorms during the growing season (April through September). The driest period is from midsummer to early autumn in the northern LRU. Precipitation in winter typically occurs as snow. The average annual temperature is 39 to 53 °F (4 to 12 °C). The freeze-free period averages 165 days and ranges from 110 to 215 days, decreasing in length with increasing elevation. The dominant soil orders in this MLRA are Aridisols, Entisols, and Mollisols. Soils are dominantly in the mesic or frigid soil temperature regime, aridic or xeric soil moisture regime, and mixed mineralogy. The soils are generally well drained, loamy or loamy-skeletal, and very deep.

LRU notes

The Basin and Range South LRU has mountain ranges that are about 40 percent sedimentary/metasedimentary (limestone/quartzite dominant) and about 40 percent Tertiary volcanics. The basin floors are generally higher in the southern LRU than in the north LRU between 4,900 and 6,100 feet (1,493 to 1,859 meters) in elevation. The Basin and Range South LRU also exhibits patterns of summers with a greater relative amount of precipitation in July and August coming from convective storms (ustic trending pattern). Pinyon and juniper ecological sites have a great percentage of pinyon pine (*Pinus edulis* or *monophylla*) than Utah juniper (*Juniperus osteosperma*), with pinyon pine up to 50 percent of the tree composition in the semidesert zones and more than 50 percent in upland zones. Warm season grasses, such as James' galleta (*Pleuraphis jamesii*) or blue grama (*Bouteloua gracilis*), are present within the plant community, and can make up a large portion of the subdominant grass composition. Bristlecone pine (*Pinus longaeva*) and cliffrose (*Purshia* sp.) are also present and dominant on some ecological sites in the southern LRU, while they are sparse or absent in the northern LRU.

Ecological site concept

The Upland Gravelly Loam (Singleleaf Pinyon-Utah Juniper) site is located on upper fan remnants on gentle slopes (2 to 15 percent) between 5,800 and 6,890 feet (1,767 to 2,100 meters). The soil is moderately deep to a duripan to deep. The soil was formed in alluvium derived from igneous rock. The precipitation ranges from 12 to 18 inches (305 to 457 mm). The dominant vegetation is singleleaf pinyon pine and Utah juniper with an understory of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and bluebunch wheatgrass (*Pseudoroegneria spicata*). Total tree cover in the reference state is about 25 percent with shrubs and grasses at 35 percent each. The relatively high value for tree cover will need to be evaluated. This site typically occurs upslope from Upland Gravelly Loam sites.

Associated sites

R028AB306UT	Upland Gravelly Loam (Bonneville big sagebrush) South This site occurs lower on the landscape.
R028AB310UT	Upland Loam (Bonneville big sagebrush) South This site occurs lower on the landscape. This site also has fewer rock fragments on the soil surface and in the profile.
R028AB334UT	Upland Stony Loam (Wyoming sagebrush) South This is a Wyoming big sagebrush site. The soils have more rock fragments.

Similar sites

R028AB338UT	Upland Stony Loam (pinyon-Utah juniper) South The soil has more rock fragments in the soil profile which effects the production of the site and can be found on steeper slopes.
R028AB324UT	Upland Shallow Loam (Singleleaf pinyon-Utah juniper) South This site is shallow and not moderately deep.
F028AY099NV	PIMO-JUOS/ARTRV/PSSPS-POFE This site is similar in species composition and production, but has a shallow soil, steeper slope and is found higher in elevation. This site was developed in Nevada.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Pinus monophylla</i> (2) <i>Juniperus osteosperma</i>
Herbaceous	Not specified

Physiographic features

The Upland Gravelly Loam (Singleleaf Pinyon-Utah Juniper) site occurs on fan remnants. This site is found on all aspects at elevations between 5,800 and 6,890 feet (1,767 to 2,100 meters). Slopes are gentle to slightly steep (2 to 15 percent). Runoff is low to medium and flooding is very rare.

Table 2. Representative physiographic features

Landforms	(1) Fan remnant
Flooding frequency	None

Ponding frequency	None
Elevation	1,770 – 2,100 m
Slope	0 – 20 %
Aspect	Aspect is not a significant factor

Climatic features

The climate is characterized by warm, dry summers, cold, snowy winters and moist springs. The average annual precipitation is between 12 and 19 inches. October through May is the wettest part of the year and July to September is the driest, except for summer convective storms that occur. These storms are intermittent and may not occur reliably every year, however they do provide enough summer moisture to alter the plant community with warm season grasses. The effective moisture for plant growth is the 57 percent that falls during the plant dormant period, which wets the soil deeply in the spring and early summer.

Table 3 Representative climatic features

Frost-free period (characteristic range)	
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	310-480 mm
Frost-free period (average)	140 days
Freeze-free period (average)	180 days
Precipitation total (average)	380 mm

Influencing water features

Due to its landscape position, streams and wetlands have no influence.

Soil features

The soils are moderately deep to deep and well drained. They typically have a duripan within 40 inches of the soil surface. They formed in alluvium derived from acid and intermediate igneous rock. The surface layer is moderately coarse to medium textured (coarse sandy loam to very gravelly loam) with up to 47 percent rock fragments. The subsoil is moderately coarse to moderately fine textured with up to 30 percent rock fragments. Available water capacity ranges from 3 to 5 inches in the upper 40 inches of soil. The site is typically weakly calcareous with a neutral pH. The soil moisture regime is xeric and the soil temperature regime is mesic.

Soil Map Units that may contain this site:

Soil Survey Area: Soil Components (Map units in parentheses)

Fairfield-Nephi Area (UT608): Butterfield (2981365, 2981379)

Beaver County, Western Part (UT626): Blackett (2220509, 2220510, 2220513)

Iron-Washington Area (UT634): Repmis (484002); Simper (484022)

Beaver-Cove Fort Area (UT640): Blackett (484564, 484565, 484566, 484694); Firmage (484592, 484629)

Table 4. Representative soil features

Parent material	(1) Alluvium – igneous rock
Surface texture	(1) Gravelly loam (2) Coarse sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderately rapid
Soil depth	50 – 150 cm
Surface fragment cover $\leq 3"$	0 – 20 %
Surface fragment cover $> 3"$	0 – 30 %
Available water capacity (0-101.6cm)	6.6 – 12.7 cm
Calcium carbonate equivalent (0-101.6cm)	10 – 30 %
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	0 – 10
Soil reaction (1:1 water) (0-101.6cm)	7.4 – 10
Subsurface fragment volume $\leq 3"$ (Depth not specified)	0 – 10 %

Subsurface fragment volume >3" (Depth not specified)	0 – 20 %
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Ecological dynamics

These plant communities may not represent every possibility, but they are the most prevalent and repeatable plant communities. As more data is collected, some of these plant communities may be revised or removed and new ones may be added. None of these plant communities should necessarily be thought of as the “desired plant community”. According to the USDA NRCS National Range and Pasture Handbook, the desired plant community will be determined by the decision makers and will meet minimum quality criteria established by the NRCS. The main purpose for including any description of a plant community here is to capture the current knowledge and experience at the time of this revision.

Utah juniper (*Juniperus osteosperma*) and singleleaf pinyon (*Pinus monophylla*) are the dominant tree species. This site is vulnerable to an increase in both pinyon and juniper trees without disturbances that keep the tree densities lower (i.e. fire). Singleleaf pinyon and Utah juniper may dominate if there is time without disturbances and eventually out-compete mountain big sagebrush for water and sunlight, severely reducing both the shrub and herbaceous understory (Miller et al. 2000, Lett and Knapp 2005). Bluegrasses may remain underneath trees on north-facing slopes. The potential for soil erosion increases as the Utah juniper woodland matures and the understory plant community cover declines (Pierson et al. 2010).

Fire Ecology:

Infilling by younger trees increases canopy cover causing a decrease in understory perennial vegetation and an increase in bare ground. Litter accumulates as pinyon and juniper trees increase in density. Phenolic compounds of juniper scales can have an inhibitory effect on grass growth (Jameson 1970). Furthermore, infilling shifts stand level biomass from ground fuels to canopy fuels which has the potential to significantly impact fire behavior. The more tree dominated pinyon and juniper woodlands become, the less likely they are to burn under moderate conditions, resulting in infrequent high intensity fires (Gruell 1999, Miller et al. 2008). Additionally, as the understory vegetation declines in vigor and density with increased canopy the seed and propagules of the understory plant community also decrease significantly. The increase in bare ground allows for the invasion of non-native annual species such as cheatgrass and with intensive wildfire the potential for conversion to annual exotics is a serious threat (Tausch 1999, Miller et al. 2008). The introduction of annual weedy species, like cheatgrass, may cause an increase in fire frequency and eventually lead to an annual dominated community (Miller et al. 2013). Infilling by singleleaf pinyon and Utah juniper may also occur with an extended fire return interval. Without fire or changes in management, pinyon and juniper will dominate the site and Bonneville big sagebrush will be severely reduced. The herbaceous understory will typically be reduced. The potential for soil erosion increases as the juniper woodland matures and the understory plant community cover declines. Catastrophic wildfire in juniper controlled sites may lead to an annual weed dominated site.

Livestock/Wildlife Grazing Interpretations:

Overgrazing leads to an increase in sagebrush and a decline in understory plants like bluebunch wheatgrass. Squirreltail will increase temporarily with further degradation. Invasion of annual weedy forbs and cheatgrass could occur with further grazing degradation, leading to a decline in squirreltail and an increase in bare ground. Wetter sites are more resistant to degradation and may end up having sagebrush and Sandberg bluegrass dominate the site. A combination of overgrazing and prolonged drought may lead to soil redistribution, increased bare ground and a loss in plant production. Bluebunch wheatgrass is moderately grazing tolerant but is very sensitive to defoliation during the active growth period (Blaisdell and Pechanec 1949, Laycock 1967, Anderson and Scherzinger 1975). Sandberg bluegrass may slow reestablishment of deeper rooted bunchgrass, increase under grazing pressure (Tisdale and Hironaka 1981), and is capable of co-existing with cheatgrass. Reduced bunchgrass vigor or density provides an opportunity for Sandberg bluegrass expansion and/or cheatgrass and other invasive species to occupy interspaces, leading to increased fire frequency and potentially an annual plant community. Depending on the season of use, the grazer, and site conditions, either Sandberg bluegrass or cheatgrass may become the dominant understory with inappropriate grazing management. For example, Daubenmire (1970) found that heavy sheep grazing favors Sandberg bluegrass, while heavy cattle grazing favors cheatgrass.

Four possible alternative stable states have been hypothesized for this ecological site. The Upland Gravelly Loam (Singleleaf Pinyon-Utah Juniper) site is similar to 028AY099NV developed in Nevada. The state and transition model and narratives used from site 099NV and applied to the Upland Gravelly Loam (Singleleaf Pinyon-Utah Juniper) (Stringham et al. 2015). The Reference State contains four community phases, shrub/grass dominated, shrub dominated, grass dominated, and a fire tolerant phase. The primary drivers in this state are fire, drought, and/or insect or disease. The Current Potential State is like the Reference State; however, non-native species have been introduced in the system which alters the resilience and resistance of the state. The Tree State occurs when there has been sufficient time for junipers and/or pinyon trees to increase in density and dominate the site dynamics. The Annual State occurs after large fires or multiple fires that promote annual invasive species dominance over native shrubs and grasses. Specific community phases and transitions will be described in the narratives below.

State and transition model

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Shrub/Vine					
0	Primary Shrubs			141-275	
	mountain big sagebrush	ARTRV	<i>Artemisia tridentata ssp. vaseyana</i>	78-157	–
	antelope bitterbrush	PUTR2	<i>Purshia tridentata</i>	39-78	–
	mormon tea	EPVI	<i>Ephedra viridis</i>	24-39	–
3	Secondary Shrubs			24-39	
	Utah serviceberry	AMUT	<i>Amelanchier utahensis</i>	8-24	–
	black sagebrush	ARNO4	<i>Artemisia nova</i>	8-24	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	8-24	–
Grass/Grasslike					
0	Primary Grasses			118-235	
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	78-157	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	39-78	–
1	Secondary Grasses			24-40	
	Columbia needlegrass	ACNE9	<i>Achnatherum nelsonii</i>	8-24	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	8-24	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	8-24	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	8-24	–
	basin wildrye	LECI4	<i>Leymus cinereus</i>	8-24	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	8-24	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	8-24	–
	muttongrass	POFE	<i>Poa fendleriana</i>	8-24	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	8-24	–
Forb					
0	Primary Forbs			24-40	
	arrowleaf balsamroot	BASA3	<i>Balsamorhiza sagittata</i>	24-40	–
2	Secondary Forbs			24-40	
	common yarrow	ACMI2	<i>Achillea millefolium</i>	8-24	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	8-24	–
	roundspike cryptantha	CRHU2	<i>Cryptantha humilis</i>	8-24	–
	granite prickly phlox	LIPU11	<i>Linanthus pungens</i>	8-24	–
	tailcup lupine	LUCAC3	<i>Lupinus caudatus ssp. caudatus</i>	8-24	–
	Pacific aster	SYCHC	<i>Symphotrichum chilense var. chilense</i>	8-24	–
Tree					
4	Trees			102-157	
	singleleaf pinyon	PIMO	<i>Pinus monophylla</i>	78-118	–
	Utah juniper	JUOS	<i>Juniperus osteosperma</i>	24-39	–

Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 7. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 1.4 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 10. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 11. Community 2.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 12. Community 2.4 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 13. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 14. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 15. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Animal community

The Upland Gravelly Loam (Singleleaf Pinyon-Utah Juniper) site is suited for grazing by cattle and sheep during fall, winter, and spring. Wildlife using this site include rabbit, coyote, fox, badger, pronghorn antelope, mule deer, and elk. This is a short list of the more common species found. Many other species are present as well and migratory birds are present at times.

Hydrological functions

This section will be added as the soil series are identified.

Recreational uses

Recreation values are hiking and hunting.

Wood products

Posts and fire wood.

Other information

Threatened and endangered species include plants and animals.

Contributors

David J. Somorville

Approval

Jamin Johanson, 5/02/2025

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.

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Date	02/09/2010
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

- 1. Number and extent of rills:** No rills present. Very minor rill development may occur in sparsely vegetated areas. If rills are present, they should be widely spaced and not connected. Rill development may increase following large storm events, but should begin to heal during the following growing season. Frost heaving will accelerate recovery. Rill development may increase when run inflow enters site from adjacent sites that produce large amounts of runoff (i.e. steeper sites, slickrock, rock outcrop). Site is essentially level and rills do not form.

- 2. Presence of water flow patterns:** Water flow patterns will be short (2-5') and meandering; interrupted by plants and exposed rocks. Some evidence of erosion or deposition associated with flow patterns. Where slopes exceed 5%, water flow patterns may be longer (5-10').

- 3. Number and height of erosional pedestals or terracettes:** Plants may have small pedestals (1-3") where they are adjacent to water flow patterns, but without exposed roots. Terracettes should be few and stable. Terracettes should be small (1-3") and show little sign of active erosion. Some plants may appear to have a pedestal but rather than be formed by erosion, the only place litter accumulates and soil collects is at plant bases forming the appearance of a pedestal. Well-developed biological crusts may appear pedestalled, but are actually a characteristic of the crust formation. Some plants may appear to have a pedestal but rather than be formed by erosion, the only place litter accumulates and soil collects is at plant bases forming the appearance of a pedestal.

4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground): 20-40% bare ground (soil with no protection from raindrop impact). Herbaceous communities are most likely to have lower values. As species composition by shrubs increases, bare ground is likely to increase. Poorly developed biological soil crust that is susceptible to raindrop splash erosion should be recorded as bare ground. Very few if any bare spaces of greater than 1 square foot.
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5. Number of gullies and erosion associated with gullies: No gullies present.
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6. Extent of wind scoured, blowouts and/or depositional areas: Very minor evidence of active wind-generated soil movement. Wind scoured (blowouts) and depositional areas are rarely present. If present they have muted features and are mostly stabilized with vegetation and/or biological crust. Gravel or desert pavement protects the site from wind scour.
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7. Amount of litter movement (describe size and distance expected to travel): Most litter resides in place with some redistribution caused by water and wind movement. Very minor litter removal may occur in flow patterns and rills with deposition occurring at points of obstruction. The majority of litter accumulates at the base of plants. Some leaves, stems, and small twigs may accumulate in soil depressions adjacent to plants. Woody stems are not likely to move.
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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): Soil surface is moderately stable (average soil stability score of 3.5 -5).
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9. Soil surface structure and SOM content (include type of structure and A-horizon color and thickness): This description is based on a combination of the 4 correlated soils for this site. This results in variation of each of these attributes. Due to the natural variability of soil attributes, it is critical to supplement this description with the soil-specific information from the published soil survey. Soil surface horizon is typically 7 to 18 inches deep. Structure is typically weak very fine granular. Color is typically grayish brown (10YR 5/2), or very dark grayish brown (10YR 3/2) moist. Mollic epipedon is common.
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10. Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff: Vascular plants and any well-developed biological soil crusts (where present) will break raindrop impact and splash erosion. Spatial distribution of vascular plants and interspaces between well-developed biological soil crusts (where present) provide detention storage and surface roughness that slows runoff allowing time for infiltration. Crowns of trees and accumulating litter at base of trees appear to create a micro-topography that may enhance development of water flow patterns below the drip line of the canopy. Significant increases in pinyon-juniper canopy reduces understory vegetation and increases 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): None. Naturally occurring soil horizons may be harder than the surface because of an accumulation of clay or calcium carbonate and should not be considered as compaction layers. A duripan (indurated layer of illuvial silica and lime) may be present
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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: bluebunch wheatgrass, mountain big sagebrush> singleleaf pinyon

Sub-dominant: Indian ricegrass, antelope bitterbrush

Other: other shrubs, grasses, forbs, trees

Additional: In the northern portion of the MLRA cool-season perennial grasses (Indian ricegrass, needle and thread) dominate. In the southernmost portion of the MLRA warm-season perennial grasses (galleta, sand dropseed) dominate. The two groups share dominance in the middle portion of the MLRA. Functional /structural groups may appropriately contain non-native species if their ecological function is the same as the native species in the reference state (e.g. crested wheatgrass and Russian wildrye may substitute for mid stature cool season perennial native bunchgrasses.). Biological soil crust is variable in its expression on this site and is measured as a component of ground cover. Forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** During years with average to above average precipitation, there should be very little recent mortality or decadence apparent in either the shrubs or grasses. Some mortality of bunchgrass and other shrubs may occur during very severe (long-term) droughts. There may be partial mortality of individual bunchgrasses and shrubs during less severe drought. Long-lived species dominate site. Open spaces from disturbance are quickly filled by new plants through seedlings and reproductive reproduction (tillering).
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14. **Average percent litter cover (%) and depth (in):** Litter cover includes litter under plants. Most litter will be fine litter. Depth should be 1-2 leaf thickness in the interspaces and up to 1/2" under canopies. Litter cover may increase to 20-30% following years with favorable growing conditions. Excess litter may accumulate in absence of disturbance. Vegetative production may be reduced if litter cover exceeds 40%.
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 650#/acre. Even the most stable communities exhibit a range of production values. Production will vary between communities and across the MRLA. Refer to the community descriptions in the ESD. Production will differ across the MLRA due to the naturally occurring variability in weather, soils, and aspect. The biological processes on this site are complex; therefore, representative values are presented in a land management context.
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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: Cheatgrass and annual forbs
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17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce sexually or asexually, except in drought years. Density of plants indicates that plants reproduce at level sufficient to fill available resource. Within capability of site there are no restrictions on seed or vegetative reproductive capacity.
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