USDA Natural Resources Conservation Service

Ecological site R029XY027NV
MAHOGANY THICKET

Last updated: 2/20/2025
Accessed: 05/10/2025

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.

MLRA notes

Major Land Resource Area (MLRA): 029X–Southern Nevada Basin and Range

The Southern Nevada Basin and Range MLRA (29) represents the transition from the Mojave Desert to the Great Basin. It is cooler and wetter than the Mojave. It is warmer and typically receives more summer precipitation than the Great Basin. This area is in Nevada (73 percent), California (25 percent), and Utah (2 percent). It makes up about 26,295 square miles (68,140 square kilometers). Numerous national forests occur in the area, including the San Bernardino, Angeles, Sequoia, Inyo, Humboldt-Toiyabe, and Dixie National Forests. Portions of Death Valley National Monument, the Nuclear Regulatory Commission's Nevada Test Site, the Hawthorne Ammunition Depot, and the Nellis Air Force Range in Nevada and the China Lake Naval Weapons Center in California also are in this MLRA. The northeast part of the Paiute Indian Reservation and the southern third of the Walker River Indian Reservation are in the part of this MLRA in Nevada, and the Lone Pine, Fort Independence, and Big Pine Indian Reservations are in the part in California.
Physiography:
The entire area is in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. The area of broad, nearly level, aggraded desert basins and valleys between a series of mountain ranges trending north to south. The basins are bordered by sloping fans and pluvial lake terraces. The mountains are uplifted fault blocks with steep side slopes and not well dissected due to limited annual precipitation. Most of the valleys in this MLRA are closed basins or bolsons containing sinks or playa lakes.
Geology:
The mountains are dominated by Pliocene and Miocene andesite and basalt rocks, Paleozoic and Precambrian carbonate rocks prominent in some areas. Scattered outcrops of older Tertiary intrusives and very young tuffaceous sediments (Pliocene and Miocene) are in the western and eastern thirds of this MLRA. The valleys consist mostly of alluvial fill and playa deposits at the lowest elevations in the closed basins.
Climate:
The average annual precipitation is 3 to 12 inches (75 to 305 millimeters) in most of this area. It may be as high as 29 inches (735 millimeters), on the higher mountain slopes. Most of the rainfall occurs as high-intensity, convective thunderstorms during the growing season. Summers are dry, but sporadic storms are common in July and August.
Water Resources:
Water resources are scarce. Ground water and surface water sources are limited. Streams are small and intermittent. Quality of surface water in naturally degraded as streams cross area of valley fill effected by dissolved salts. Irrigation water may raise the levels of dissolved salts and suspended sediments causing contamination.
Soils:
Dominant soil orders include Entisols and Aridisols.

Ecological site concept

The Mahogany Thicket site occurs on mountain sideslopes on all aspects. Slopes range from 15 to 50 percent. Elevations are 6400 to about 10,000 feet. Soils are moderately deep and well drained. The available water capacity is low to moderate. Permeability is slow to moderate. These soils are typically modified with high volumes of rock fragments throughout the soil profile.

Associated sites

R029XY051NV	**LOAMY SLOPE 16+ P.Z.** This site occurs on straight to convex mountain sideslopes on all exposures. This site is restricted to northerly aspects at the lower elevations of its occurrence. Slopes range from 2 to 75 percent, but slope gradients of 15 to 75 percent are typical. Elevations are 7000 to about 10,000 feet. The soils are from residuum and colluvium derived from volcanic rocks. These soils are typically well drained.
R029XY052NV	**CLAYPAN 16+ P.Z.** This site occurs on straight to convex mountain summits, ridges, and sideslopes on all exposures. This site is restricted to northerly aspects at the lower elevations of its occurrence. Slopes range from 8 to 50 percent. Elevations range from 5800 to about 10000 feet. The soils have formed in residuum and colluvium. They are shallow to very deep with a layer restrictive to root development close to the soil surface.
R029XY053NV	**MOUNTAIN RIDGE 16+ P.Z.** This site occurs on high elevation, wind-blown, mountain ridges and summits on all exposures. Slopes range from 8 to over 50 percent. Elevations are 7000 to over 10000 feet. The soils formed in residuum from volcanic rocks. The soils are shallow to very shallow to bedrock and well drained.

Similar sites

R029XY043NV	**MAHOGANY SAVANNA** More productive understory, yet overall site productivity is less; overstory canopy cover is less than 50%.

Table 1. Dominant plant species

Tree	(1) *Cercocarpus ledifolius*
Shrub	(1) *Artemisia tridentata ssp. vaseyana*
Herbaceous	(1) *Achnatherum* (2) *Leymus cinereus*

Physiographic features

The Mahogany Thicket site occurs on mountain sideslopes on all aspects. Slopes range from 4 to 50 percent, but slope gradients of 15 to 30 percent are typical. Elevations are 6500 to about 10,000 feet.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope
Runoff class	Very high
Elevation	6,500–10,000 ft
Slope	4–50%
Water table depth	72 in
Aspect	Aspect is not a significant factor

Climatic features

The climate is cool, semiarid with warm dry summers and cool moist winters. Average annual precipitation is 16 to over 20 inches. Mean annual air temperature is 39 to 45 degrees F. The average growing season is about 60 to 90 days. There is no climate station available for this site.

Table 3. Representative climatic features

Frost-free period (average)	90 days
Freeze-free period (average)	

Precipitation total (average)	20 in

Influencing water features

There are no influencing water features associated with this site.

Soil features

Soils are moderately deep and well drained. The available water capacity is low to moderate. Permeability is slow to moderate. These soils are typically modified with high volumes of rock fragments throughout the soil profile. The subsoil is neutral or slightly acid in reaction. Runoff is high to very high depending on slope. Soil series associated with this site include Suak and Ravenswood variant.

Table 4. Representative soil features

Parent material	(1) Residuum–volcanic breccia (2) Colluvium–volcanic breccia
Surface texture	(1) Very cobbly loam (2) Very stony loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to moderate
Soil depth	20–72 in
Surface fragment cover <=3"	15–35%
Surface fragment cover >3"	19–29%
Available water capacity (0-40in)	1.3–3.1 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	6.6–7.8
Subsurface fragment volume <=3" (Depth not specified)	10–41%
Subsurface fragment volume >3" (Depth not specified)	15–30%

Ecological dynamics

In western and central Nevada communities in which curlleaf mountain-mahogany occurs, large-scale disturbance was infrequent in presettlement times. However, evidence of small-scale disturbance from lightning, low-severity fire, insects, wind, and snow is abundant. Small disturbances often create canopy gaps in dense stands of curlleaf mountain mahogany. Gaps allow for the release of young curlleaf mountain mahogany.

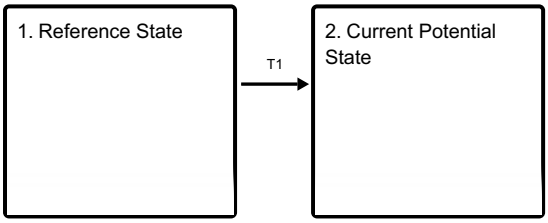
The successional role of curlleaf mountain mahogany varies with community type. Mountain brush communities in which curlleaf mountain mahogany is either dominant or codominant are generally stable. Changes in relative abundance of codominant species may occur; however, succession rates are extremely slow because vegetation changes depend on soil development which is also slow.

Where management results in abusive livestock and big game use, understory grasses and forbs are reduced as snowberry increases. Heavy browsing by livestock or big game animals will result in the reproduction and overall productivity of curlleaf mountain mahogany to be adversely impacted. Species likely to invade this site are annuals such as cheatgrass.

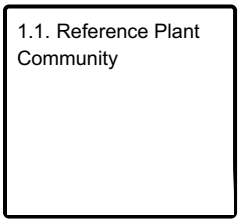
Fire Ecology:
The presettlement fire regime of curlleaf mountain mahogany communities probably varied with community type and structure. Schultz found large curlleaf mountain mahogany up to 1,350 years old in western and central Nevada, indicating that severe fire has been infrequent in some curlleaf mountain-mahogany communities. Schultz also found fire scars on large, old-growth curlleaf mountain mahogany in the Shoshone Range of central Nevada that suggested understory fuels were insufficient to carry severe fire. Some old-growth curlleaf mountain mahogany avoid fire by growing on extremely rocky sites. Individual curlleaf mountain mahogany are severely damaged by fire. Because many dead branches persist in the crown and leaves are slightly resinous, curlleaf mountain mahogany is probably very flammable. Curlleaf mountain-mahogany is a weak sprouter after a fire. Mountain big sagebrush is highly susceptible to injury from fire. Plants are readily killed in all seasons, even light severity fires. Mountain big sagebrush plants top-killed by fire will not resprout. Common snowberry has high resistance to fire. It is a rhizomatous species with rhizomes buried 2 to 5 inches (5-12.5 cm) deep in mineral soil. After fire has killed the top of the plant, new growth sprouts from these rhizomes. This rhizomatous growth response is highly variable and depends on conditions at specific sites. Regeneration from buried seed is favored by fires of low severity and short duration that remove little of the soil organic level. Western needlegrass is moderately damaged by fire. The recovery time is between 3 and 5 years. Nevada needlegrass is only slightly to moderately damaged by fire, because it has relatively few culms per clump which may help to minimize the amount of subsurface heat transfer. Columbia needlegrass is only slightly to moderately damaged by fire, because it has relatively few culms per clump which may help to minimize the amount of subsurface heat transfer and subsequent damage. Little specific information is available on adaptations of Letterman's needlegrass to fire. It is morphologically similar to Columbia needlegrass, which is only slightly to moderately damaged by fire. Season of burn affects the plant's ability to survive a fire. Post-fire regeneration is through seeding and tillering. Basin wildrye is top-killed by fire. Older basin wildrye plants with large proportions of dead material within the perennial crown can be expected to show higher mortality due to fire than younger plants having little debris. Basin wildrye is generally tolerant of fire but may be damaged by early season fire combined with dry soil conditions. Muttongrass is unharmed to slightly harmed by light-severity fall fires. Muttongrass appears to be harmed by and slow to recover from severe fire.

State and transition model

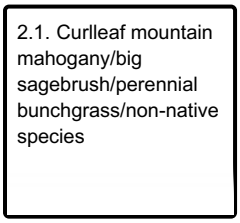
Ecosystem states



State 1 submodel, plant communities



State 2 submodel, plant communities



State 1
Reference State

The Reference State 1.0 is a representative of the natural range of variability under pristine conditions. The Reference State has two general community phases; a tree-shrub dominant phase and a shrub dominant phase. State dynamics are maintained by interactions between climatic patterns and disturbance regimes. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These include the presence of all structural and functional groups, low fine fuel loads, and retention of organic matter and nutrients. Plant community phase changes are primarily driven by fire, periodic drought and/or insect attack.

Community 1.1
Reference Plant Community

The reference plant community is dominated by curlleaf mountain mahogany. Basin wildrye, western needlegrass and Columbia needlegrass are important understory species. A few singleleaf pinyon, Utah juniper or other conifer trees may be scattered through the stand. Total overstory canopy cover exceeds 50 percent. Understory vegetation comprises about 10 percent of the total site production. Potential vegetative composition for the understory is about 55 percent grasses, 15 percent forbs and 30 percent shrubs. Overstory trees and tree-like shrub composition is about 90 percent of the total site production.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Tree	2040	2160	2280
Grass/Grasslike	72	126	180
Shrub/Vine	27	75	120
Forb	15	45	75
Total	**2154**	**2406**	**2655**

State 2
Current Potential State

This state is similar to the Reference State 1.0. This state has the same two general community phases. Ecological function has not changed, however the resiliency of the state has been reduced by the presence of invasive weeds. These non-natives can be highly flammable, and can promote fire where historically fire had been infrequent. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These include the presence of all structural and functional groups, low fine fuel loads, and retention of organic matter and nutrients. Positive feedbacks decrease ecosystem resilience and stability of the state. These include the non-natives' high seed output, persistent seed bank, rapid growth rate, ability to cross pollinate, and adaptations for seed dispersal.

Community 2.1
Curlleaf mountain mahogany/big sagebrush/perennial bunchgrass/non-native species

This community phase is similar to the Reference State Community Phase 1.1, with the presence of non-native species in trace amounts. This community is dominated by curlleaf mountain mahogany. Small disturbances that damage or kill individual trees open up areas in the canopy. Mountain big sagebrush and mountain snowberry make up the shrub components of the understory. Bluebunch wheatgrass and Thurber's needlegrass make up the perennial bunchgrasses. Forbs and other grasses are a small component of the understory. Annual non-native species are present.

Transition T1
State 1 to 2

Trigger: This transition is caused by the introduction of non-native annual plants, such as cheatgrass, mustards, and thistles. Slow variables: Over time annual non-native species increase within the community. Threshold: Any

amount of introduced non-native species causes an immediate decrease in the resilience of the site. Annual non-native species cannot be easily removed from the system and have the potential to significantly alter disturbance regimes from their historic range of variation.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Primary Perennial Grasses**			66–150	
	basin wildrye	LECI4	*Leymus cinereus*	30–60	–
	muttongrass	POFE	*Poa fendleriana*	6–30	–
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	7–15	–
	Nevada needlegrass	ACNE10	*Achnatherum nevadense*	8–15	–
	Columbia needlegrass	ACNEN2	*Achnatherum nelsonii ssp. nelsonii*	7–15	–
	western needlegrass	ACOCO	*Achnatherum occidentale ssp. occidentale*	8–15	–
2	**Secondary Perennial Grasses**			6–30	
	desert needlegrass	ACSP12	*Achnatherum speciosum*	12–72	–
	mountain brome	BRMA4	*Bromus marginatus*	12–72	–
	Sandberg bluegrass	POSE	*Poa secunda*	12–72	–
	beardless wheatgrass	PSSPI	*Pseudoroegneria spicata ssp. inermis*	12–72	–
Forb					
3	**Perennial**			15–75	
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	12–120	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	12–120	–
	lupine	LUPIN	*Lupinus*	12–120	–
	ragwort	SENEC	*Senecio*	12–120	–
Shrub/Vine					
4	**Primary Shrubs**			21–75	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	15–45	–
	snowberry	SYMPH	*Symphoricarpos*	6–30	–
5	**Secondary Shrubs**			6–45	
	Utah serviceberry	AMUT	*Amelanchier utahensis*	24–120	–
	creeping barberry	MARE11	*Mahonia repens*	24–120	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	24–120	–
	currant	RIBES	*Ribes*	24–120	–
Tree					
6	**Evergreen**			2076–2304	
	curl-leaf mountain mahogany	CELE3	*Cercocarpus ledifolius*	2040–2160	–
	limber pine	PIFL2	*Pinus flexilis*	12–48	–
	singleleaf pinyon	PIMO	*Pinus monophylla*	12–48	–
	white fir	ABCO	*Abies concolor*	12–48	–
7	**Deciduous trees**			12–48	
	quaking aspen	POTR5	*Populus tremuloides*	12–48	–

Animal community

Livestock Interpretations:
This site has little value for livestock grazing due to steep slopes and low understory forage production. Western needlegrass has a spreading and deeply penetrating root system, which makes it resistant to trampling. Nevada

needlegrass is unaffected by moderate grazing, but disappears under heavy grazing. As with most needlegrasses, it is most palatable early in the season before the foliage becomes coarse and wiry. Palatability to cows and horses is increased because large amounts of fine leafage remain green throughout the growing season. Palatability of Nevada needlegrass is described as fair to good for cattle and horses, becoming nearly unpalatable at maturity. Columbia needlegrass provides valuable forage for all classes of livestock. Overall production is generally low in the upper sagebrush and mountain brush zones and at the limits of its range where Columbia needlegrass grows only in scattered patches. It is especially valuable to cattle and horses on summer ranges and to domestic sheep on lambing grounds. It is more often cropped closely by cattle and horses than by sheep. Columbia needlegrass is palatable to livestock throughout its range. As with most needlegrasses, it is most palatable early in the season before the foliage becomes coarse and wiry. Palatability to cows and horses is increased because large amounts of fine leafage remain green throughout the growing season. Palatability of Columbia needlegrass is described as fair to good for cattle and horses, becoming nearly unpalatable at maturity. Letterman’s needlegrass begins growth early in the year and remains green throughout the relatively long growing season, thus, making it valuable forage for livestock. The early growth and abundant production of basin wildrye make it a valuable source of forage for livestock. It is important forage for cattle and is readily grazed by cattle and horses in early spring and fall. Though coarse-textured during the winter, basin wildrye may be utilized more frequently by livestock and wildlife when snow has covered low shrubs and other grasses. Muttongrass is excellent forage for domestic livestock especially in the early spring. Muttongrass begins growth in late winter and early spring, which makes it available before many other forage plants. Common snowberry is considered important browse for many types of livestock. It is especially important to domestic sheep and cattle. Common snowberry is highly palatable to cattle. It plays a critical role in permitting cattle to meet their protein requirements during the latter half of the growing season. Domestic sheep also utilize common snowberry for browse and it is considered fair to good forage. It is has no forage value for horses. Curlleaf mountain-mahogany is highly nutritious although it has fair palatability for livestock.

Stocking rates vary over time depending upon season of use, climate variations, site, and previous and current management goals. A safe starting stocking rate is an estimated stocking rate that is fine tuned by the client by adaptive management through the year and from year to year.

Wildlife Interpretations:
Curlleaf mountain-mahogany stands provide hiding and thermal cover for a variety of wildlife species. Common snowberry is considered important browse for many types of wildlife. Bighorn sheep use common snowberry regularly during the summer. Forage value to elk is fair. Common snowberry is important as both cover and food for bird and small mammal populations. These include sharp-tailed, ruffed, and blue grouse, wild turkey and, several non-game species of bird including the kingbird, western flycatcher, and western bluebird. Among small mammals that rely on common snowberry are fox squirrels, desert cottontails, and pocket gopher. Western needlegrass provides valuable forage for many species of wildlife. Nevada needlegrass provides valuable forage for many species of wildlife. It is consumed by mule deer and other wildlife species throughout the growing season. As with most needlegrasses, it is most palatable early in the season before the foliage becomes coarse and wiry. Palatability of Nevada needlegrass is described as "fair" for wildlife overall, becoming nearly unpalatable at maturity. Columbia needlegrass provides valuable forage for many species of wildlife. It is also consumed by mule deer and other wildlife species throughout the growing season. Needlegrasses are a significant component in the diet of pocket gophers. Columbia needlegrass is palatable to many species of wildlife throughout its range. As with most needlegrasses, it is most palatable early in the season before the foliage becomes coarse and wiry. Palatability of Columbia needlegrass is described as fair for wildlife overall, becoming nearly unpalatable at maturity. Letterman's needlegrass provides valuable forage for many species of wildlife. It is consumed by mule deer and is most palatable early in the season before the foliage becomes coarse and wiry. Basin wildrye provides winter forage for mule deer, though use is often low compared to other native grasses. Basin wildrye provides summer forage for black-tailed jackrabbits. Because basin wildrye remains green throughout early summer, it remains available for small mammal forage for longer time than other grasses. Deer and elk make heavy use of muttongrass, especially in early spring when other green forage is scarce. Depending upon availability of other nutritious forage, deer may use muttongrass in all seasons. Muttongrass cures well and is an important fall and winter deer food in some areas.

Hydrological functions

Runoff is high to very high depending on slope.

Recreational uses

Aesthetic value is derived from the diverse floral and faunal composition and the colorful flowering of wild flowers and shrubs during the spring and early summer. This site offers rewarding opportunities to photographers and for nature study. This site is used for camping and hiking and has potential for upland bird and big game hunting.

Other products

Because curlleaf mountain-mahogany wood burns slowly, it was the preferred charcoal wood used for smelting ores in the nineteenth century. It is also highly prized as a barbecue fuel. Because of its tolerance to heat and drought, curlleaf mountain-mahogany can be used for water-efficient landscaping in arid environments. Native peoples used big sagebrush leaves and branches for medicinal teas, and the leaves as a fumigant. Bark was woven into mats, bags and clothing. Common snowberry fruit fruits were eaten fresh and also dried for winter use by Native Americans. Common snowberry was also used on hair as soap, and the fruits and leaves mashed and applied to cuts or skin sores as a poultice and to soothe sore, runny eyes. Tea from the bark was used as a remedy for tuberculosis and sexually transmitted diseases. A brew made from the entire plant was used as a physic tonic. Arrowshafts and pipestems were made from the stems. Basin wildrye was used as bedding for various Native American ceremonies, providing a cool place for dancers to stand.

Other information

Curlleaf mountain mahogany may be planted to help stabilize soil in disturbed areas such as roadcuts and mine spoils. Basin big sagebrush shows high potential for range restoration and soil stabilization. Basin big sagebrush grows rapidly and spreads readily from seed. Letterman’s needlegrass has been used successfully in revegetating mine spoils. This species also has good potential for erosion control. Basin wildrye is useful in mine reclamation, fire rehabilitation and stabilizing disturbed areas. Its usefulness in range seeding, however, may be limited by initially weak stand establishment.

Inventory data references

NASIS soil component data.

Type locality

Location 1: Nye County, NV	
Township/Range/Section	T15N R51E S28

Other references

Fire Effects Information System (Online; http://www.fs.fed.us/database/feis/plants/).

United States Department of Agriculture, Natural Resources Conservation Service. 2022. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture, Agriculture Handbook 296.

USDA-NRCS Plants Database (Online; http://www.plants.usda.gov).

Contributors

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Approval

Kendra Moseley, 2/20/2025

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.

Author(s)/participant(s)	P NOVAK-ECHENIQUE
Contact for lead author	State Rangeland Management Specialist.
Date	04/02/2014
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are rare to few. Occurrence of rills may be more frequent as canopy cover increases and on steeper slopes.

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2. **Presence of water flow patterns:** Water flow patterns are none to rare with occurrence increasing as canopy cover increases.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals are rare to few. Occurrence is usually limited to areas of water flow patterns. Frost heaving of shallow rooted plants should not be considered an indicator of soil erosion.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground 10-25% depending on amount of surface rock fragments.

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5. **Number of gullies and erosion associated with gullies:** None

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None.

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7. **Amount of litter movement (describe size and distance expected to travel):** Fine litter (foliage from grasses and annual & perennial forbs) expected to move distance of slope length during intense summer convection storms or rapid snowmelt events. Persistent litter (large woody material) will remain in place except during large rainfall events. Mat of accumulating leaf litter under mature trees is very stable and shows no obvious movement.

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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 stability values should be 4 to 6 on most soil textures found on this site.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface structure is typically subangular blocky. Soil surface colors are grayish-brown and soils are typified by a mollic epipedon. Organic matter of the surface 2 to 4 inches is typically 2 to 4 percent, dropping off quickly below. Organic matter content can be more or less depending on micro-topography.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Perennial herbaceous plants (especially deep-rooted bunchgrasses [i.e., needlegrasses] slow runoff and increase infiltration. Curlleaf mountain mahogany and understory shrubs break raindrop impact and provide opportunity for snow catch and accumulation on site.

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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):** Compacted layers are none. Subsoil argillic horizons are not to be interpreted as compacted layers.

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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: Curlleaf mountainmahogany

    Sub-dominant: deep-rooted, cool season, perennial bunchgrasses > associated shrubs > shallow-rooted, cool season, perennial grasses > shallow-rooted, cool season, perennial forbs > fibrous, shallow-rooted, cool season, perennial forbs

    Other: trees

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Overstory trees have little mortality. Dead branches within understory shrubs are common and standing dead shrub canopy material may be as much as 35% of total shrub canopy; mature bunchgrasses (<25%) may have dead centers.

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14. **Average percent litter cover (%) and depth (in):** Herbaceous, or non-persistent, litter within curlleaf mountainmahogany canopy interspaces (± 35%) and litter depth is ± ½ inch. Leaf litter forms a mat 1 to 2 inches thick under the drip line of mature mountainmahogany. Large, persistent, litter from trees (limbs, etc.) variable to 5%.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Total for all trees, shrubs and herbaceous plants, irrespective of plant height for normal or average growing season (through June) = ± 2400 lbs/ac Favorable years + 3000 lbs/ac and unfavorable years + 1700 lbs/ac. For understory vegetation to 4½ feet and normal or average growing season (through June) = ± 150 lbs/ac. Favorable years + 300 lbs/ac and unfavorable years + 75 lbs/ac.

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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: Potential invaders include cheatgrass and annual mustards.

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17. **Perennial plant reproductive capability:** All functional groups should reproduce in average (or normal) and above average growing season years. Reduced growth and reproduction occur during extreme or extended drought conditions.
