

USDA icon Natural Resources
Conservation Service

Ecological site R013XY015ID

Steep Stony Mahogany

16-22 PZ CELE3-ARTRV/PSSPS

Last updated: 2/13/2025

Accessed: 08/30/2026

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): 013X–Eastern Idaho Plateaus

013X-Eastern Idaho Plateaus Precipitation or Climate Zone: 16-22" P.Z. <https://soils.usda.gov/survey/geography/mlra/index.html>

Classification relationships

Land Resource Unit: B (Northwestern Wheat and Range) MLRA: 13 (Eastern Idaho Plateaus) EPA EcoRegion: Level III (Middle Rockies)

Ecological site concept

Site does not receive any additional water. Soils are: not saline or saline-sodic. moderately deep, shallow, with >35% stone (10-25") and boulder (>25") cover. skeletal within 20" of soil surface, fragment percentage increasing with depth strongly or violently effervescent in surface mineral 10". textures usually range from very fine sandy loam to clay loam in surface mineral 4". Slope is > 30%. Clay content is = 32% in surface mineral 4". Site does not have an argillic horizon with > 35% clay.

Associated sites

R013XY003ID	Steep South 16-22 PZ ARTRV/PSSPS
R013XY005ID	Loamy 16-22 PZ ARTRV/FEID-PSSPS
R013XY014ID	Shallow Stony 12-20 PZ ARAR8/PSSPS
R013XY019ID	Stony Loam 16-22 PZ ARTRV/PSSPS
R013XY031ID	Steep Stony North 16-22 PZ ARTRV/FEID

Similar sites

R013XY010ID	Mahogany North Slope 16-22 PZ CELE3/PSSPS
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Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site occurs on steep mountain slopes, ridges and foothills. Slopes range from 20 to 70 percent on all aspects. Elevations range from 4500 to 8000 feet (1375 to 2500 meters).

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Ridge
Flooding frequency	None
Elevation	1,370 – 2,440 m
Slope	20 – 70 %
Water table depth	50 cm
Aspect	Aspect is not a significant factor

Climatic features

MLRA 13, the Eastern Idaho Plateaus, is part of the Northwestern Wheat and Range Region. Its elevation ranges from 4209 to 9331 feet above sea level, with an average elevation of 5787 feet. The average annual precipitation is 16.41 inches, with a range of 13.56 to 18.75 inches, based on ten long term climate stations located throughout the MLRA. A spike in precipitation amount often occurs in late spring, usually in May.

Temperatures vary widely in the MLRA throughout the year. A maximum temperature of 103° Fahrenheit occurred at the McCammon climate station (# 105716; elevation 4770 feet), while a minimum of -41° was recorded at the Kilgore station (#104908). At all stations temperatures throughout the year are usually below the national average. Kilgore also recorded the greatest annual snowfall amount of 217 inches. The average temperature is 41.4 degrees F. with an average high of 55.3 degrees and an average low of 27.5 degrees.

The frost-free period ranges from 64 to 90 days, while the freeze-free period can be 98 to 123 days.

Table 3 Representative climatic features

Frost-free period (average)	90 days
Freeze-free period (average)	120 days
Precipitation total (average)	480 mm

Influencing water features

This site is not influenced by adjacent wetlands, streams, or run on.

Soil features

The soils on this site are very to extremely stony loams and silt loams. They are formed in residuum, alluvium and colluvium from sandstone and limestone with some loess influence. The soils are shallow to moderately deep to highly fractured bedrock. Coarse fragments are present in the soil profile and generally increase with depth, and can exceed 35 percent by volume. Permeability is slow to moderately rapid. The available water holding capacity (AWC) is moderate. Surface runoff from bare soils is rapid or very rapid and the hazard of water erosion is very high with increased slope. These soils are characterized by a xeric soil moisture regime and a frigid soil temperature regime.

Soil Series Correlated to this Ecological Site

Ireland
Lilcan
Preussrange
Swanner
Valmar

Table 4. Representative soil features

Surface texture	(1) Gravelly silt loam (2) Stony loam (3) Very stony
Drainage class	Well drained
Permeability class	Slow to moderately rapid
Soil depth	30 – 100 cm
Surface fragment cover <=3"	10 – 30 %
Surface fragment cover >3"	0 – 50 %
Available water capacity (0-101.6cm)	2.54 – 8.89 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 10 %

Sodium adsorption ratio (0-101.6cm)	0 – 10
Soil reaction (1:1 water) (0-101.6cm)	6.1 – 8.4
Subsurface fragment volume <=3" (Depth not specified)	40 – 80 %
Subsurface fragment volume >3" (Depth not specified)	0 – 50 %

Ecological dynamics

Ecological Dynamics of the Site:

The dominant visual aspect of this site is a stand of curlleaf mountain mahogany with an understory of bluebunch wheatgrass and some forbs. Composition by weight is 20-30 percent grasses, 10-15 percent forbs, and 55-65 percent shrubs (and tree-like shrubs).

During the last few thousand years, this site has evolved in a semi-arid climate characterized by dry summers and cold, wet winters. Herbivory has historically occurred on this site at low levels of utilization. Herbivores include mule deer, Rocky Mountain elk, lagomorphs, and small rodents.

Fire has historically occurred on the site at intervals of 250-500 years. Due to the variability of soil depth, from very shallow to shallow (and deep in some crevasses), curlleaf mountain mahogany has a patchy or clumpy appearance on the landscape. For this reason when the site burns, fire moves across the site leaving a mosaic of burned and unburned areas.

The Historic Climax Plant Community (HCPC), the Reference State (State 1), moves through many phases depending on the natural and man-made forces that impact the community over time. State 1, described later, indicates some of these phases. The Reference Plant Community Phase is Phase A. This Phase is dominated by curlleaf mountain mahogany in the overstory and bluebunch wheatgrass in the understory. Nevada bluegrass, slender wheatgrass, arrowleaf balsamroot, cutleaf balsamroot, tapertip hawksbeard, lupine, and mountain snowberry are subdominant. The plant species composition of Phase A is listed later under "Reference Plant Community Phase Plant Species Composition".

Utah juniper sites may occur in association with this site. Utah juniper can invade this site when a seed source is present. Conifers such as juniper have greater growth rates, their shape is more tapered and they reach greater heights. Consequently, conifer species invading curlleaf mountain mahogany sites eventually over top them. Because mature curlleaf mountain mahogany is shade intolerant its competitive ability is lost, and it becomes senescent. Mortality usually follows.

Total annual production is 1950 pounds per acre (2184 kilograms per hectare) in a normal year. Production in a favorable year is 2400 pounds per acre (2688 kilograms per hectare). Production in an unfavorable year is 1450 pounds per acre (1624 kilograms per hectare).

Structurally, curlleaf mountain mahogany dominates the overstory along with a variety of other shrubs in small amounts. In the understory cool season deep rooted perennial bunchgrasses are dominant, followed by perennial forbs while shallow rooted perennial bunchgrasses are subdominant.

FUNCTION:

This site is poor for livestock grazing due to steep slopes, dense stands of curlleaf mountain mahogany, and surface rocks. Big game animals use the site in the spring, summer, and fall. It is important for both hiding and thermal cover. Birds use the mahogany for nesting. This site is very important as summer habitat for mountain bluebirds. The site has high value for hunting and photography. The mountain mahogany provides visual diversity to the landscape. This site is fairly resistant to degradation due to the steep slopes and surface stones.

Impacts on the Plant Community.

Influence of fire:

Because of its topographic position on the landscape, on mountain side slopes and near ridgetops, fires started by lightning strikes are fairly common. The site is extremely rocky on the surface and rock outcrops may be present. For this reason when the site burns, fire moves across the site leaving a mosaic of burned and unburned areas. Fires of this nature rarely involve large acreages due to surrounding rimrocks and other features that limit the spread of fire. The site rarely, if ever burns in its entirety.

Where there is a Utah juniper seed source in the vicinity and in the absence of normal fire frequency, juniper increases to the point of severely reducing nearly all of the understory and overstory species. Juniper has a greater growth rate, its shape is more tapered and it reaches greater heights. Consequently, juniper invading curleaf mountain mahogany sites eventually over tops them. Because mature curleaf mountain mahogany is shade intolerant its competitive ability is lost, and it becomes senescent. See "Influence of juniper invasion" below.

On the area that burns, shrubs such as curleaf mountain mahogany and mountain big sagebrush will be killed. Recovery after fire is relatively rapid due to the proximity of a desirable seed source and favorable moisture regime.

A frequent fire regime, one every 5-10 years, generally does not develop on this site. Soils are too shallow and fuels are not continuous enough for a frequent fire cycle to occur.

Influence of improper grazing management:

Improper grazing management can damage this site moderately. Due to the rough and rocky nature of the site, livestock generally prefer not to use it. Forage production is low. When this site is being impacted by improper grazing management, adjacent sites that are more productive and less rocky are usually being much more severely degraded.

Generally juniper seedlings can replace the desirable grasses and shrubs if improper grazing management continues.

When grazing does occur, season-long grazing and excessive utilization can be detrimental to this site. This type of management leads to reduced vigor of the bunchgrasses and palatable shrubs. With reduced vigor, recruitment of these species declines.

Proper grazing management that addresses frequency, duration, and intensity of grazing can also keep fine fuels from developing, thereby reducing fire frequency. This can lead to gradual increases in curleaf mountain mahogany. Proper grazing management provides for a balanced plant community of grasses, forbs, and shrubs.

Weather influences:

Above normal precipitation in the spring increases forage production slightly. Only in the areas with deeper soils do plants capitalize on extra spring moisture. Below normal precipitation in the spring can reduce production and ultimately cause plant mortality if drought continues.

Juniper is very resistant to drought influences. It has a root system that is capable of removing deep moisture in the fractures of the bedrock that is not available to other plants on the site. In addition, juniper is capable of photosynthesizing (growing) anytime the air temperatures are above freezing. It therefore is removing moisture from the soil for 10-11 months of the year. This gives juniper a competitive advantage for moisture over all of the other species on the site.

Influence of Insects and disease:

Outbreaks can affect vegetation health. Outbreaks of a curleaf mountain mahogany defoliating moth *Stamnodes animata*, occur at infrequent intervals. Two consecutive years of severe defoliation can also cause mortality.

Influence of noxious and invasive plants:

Many of these species add to the fine-fuel component and lead to increased fire frequency.

Many of the annual and perennial invasive species with deep root systems compete with desirable plants for moisture and nutrients. Many of the invaders, however, are shade intolerant and do not become established. But with invasion, the result is reduced production and change in composition of the understory.

Influence of wildlife:

Big game animals use this site in the spring, summer, and fall. Their numbers are seldom high enough to adversely affect the plant community. Herbivory can be detrimental to young curleaf mountain mahogany when livestock grazing and browsing by big game occurs at the same time and season. This will occur when both kinds of animal are using the plant in the late summer or fall. The adverse impact is excessive use of the current years' leader growth.

Watershed.

Decreased infiltration and increased runoff occur with the invasion of juniper. Juniper invasion can be triggered by lack of fire, improper grazing management, and prolonged drought. The increased runoff also causes sheet and rill erosion in the interspaces of rocks. The long term effect is a transition to a different state.

Influence of juniper invasion:

The following discussion deals with both western juniper and Utah juniper.

In plant communities that are invaded by juniper, the species has a competitive advantage for the following reasons:

- Juniper is very drought tolerant.
- It has the ability to extract soil moisture from a wide range of soil depths.
- Juniper has high evapo-transpiration rates.
- The species intercepts rain and snow before it reaches the soil surface.
- It has the ability to grow as long as there is soil moisture and the temperature is above freezing.
- Juniper has a relatively rapid growth rate and is long-lived. It can readily over-top shade intolerant species which leads to mortality.
- Nutrient cycling is reduced.
- As the canopy closes, juniper gains control of energy capture.

As juniper extracts water, other plants are unable to acquire sufficient water and nutrients to sustain growth and reproduction, thus reducing cover and biomass in the interspaces. After the canopy closes, there is sufficient soil moisture available for shallow-rooted, shade tolerant species to persist directly under the tree.

The following hydrologic impacts occur on sites invaded by juniper:

- Infiltration in the interspaces is reduced.
- Run-off increases resulting in increased sheet and rill erosion with elevated sediment loads.
- Soil temperatures increase in the interspaces which results in accelerated drying of the soil surface.
- Increased bare ground in the interspaces.
- Soil moisture storage is reduced.

As bare ground and interconnectiveness of bare ground increases, flow rates are accelerated (reduction of flow sinuosity) and run-off out of the area increases.

Degradation of these systems can result in the formation of a feedback cycle in which greater juniper cover and density results in greater plant and soil disturbance between the canopies.

In summary, a closed juniper community takes control of the following ecological processes: (1) hydrology, (2) energy capture, and (3) nutrient cycling. The changes are primarily driven by the hydrologic processes. The development of a closed juniper canopy always results in a transition across the threshold to a different state. Generally, when juniper canopy cover nears 20%, the plant community is approaching the threshold.

Plant Community and Sequence:

Transition pathways between common vegetation states and phases:

State 1.

Phase A to B. Develops with improper grazing management and no fire. This phase would be unusual since livestock use is limited by surface rocks and steep slopes.

Phase B to A. Develops through prescribed grazing and no fire .

Phase A to C. Develops after wildfire. Improper grazing management may accelerate the transition from Phase A to Phase C.

Phase C to A. Moves towards the RPC with no fire and prescribed grazing.

Phase A to D. Develops with no fire.

Phase D to A. Develops with brush management.

State 1 Phase D to Unknown New Site. Continued lack of fire and improper grazing management cause this state to cross the threshold

and retrogress to a new site with reduced potential due to significant soil loss and changes in hydrology. It is not economical to return this site to State 1 with accelerated practices. The new site may be similar to Juniper Breaks 12-16".

Practice Limitations:

This site has severe limitations for facilitating and accelerating practices due to steep slopes, surface stones and shallow soils. Any brush control practices should be carefully evaluated because maintaining curleaf mountain mahogany on the site has high value to the entire ecosystem.

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 (%)
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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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Animal community

Wildlife Interpretations. Animal Community – Wildlife Interpretations Mule deer and elk are the large herbivores using this site. The rangeland provides seasonal habitat for resident and migratory animals including western toad, sagebrush lizard, shrews, ground squirrels, mice, coyote, red fox, badger, sage-grouse, Ferruginous hawk, prairie falcon, and mountain bluebirds. Encroachment of noxious and invasive plant species (cheatgrass and bulbous bluegrass) in isolated areas can replace native plant species which provide critical feed, brood-rearing, and nesting cover for a variety of native wildlife. Water features are sparse provided by artificial water catchments and springs. State 1 Phase 1.1 –Curleaf Mountain-Mahogany/ Bluebunch Wheatgrass/ Nevada Bluegrass/ Slender Wheatgrass Reference Plant Community (RPC) This plant community provides a diversity of grasses, forbs, and shrubs used throughout the growing season by native insect communities that assist in pollination. The reptile and amphibian community is represented by common sagebrush lizard, western rattlesnake, Great Basin spadefoot toad, western toad, and northern leopard frog. Amphibians are associated with springs and isolated water bodies adjacent to this plant community. Development of spring sites that collect all available water would exclude amphibian use on these sites. The diverse vertical structure offers habitat for many bird species including mountain bluebird, rock wren, grouse, waxwings, and flycatchers. The plant community provides forage for mule deer and elk throughout the year. Mahogany is a preferred winter browse for mule deer and elk. The site provides thermal and young of year cover for mule deer and elk. A small mammal population including golden-mantled ground squirrels, jackrabbits, deer mice, and Great Basin pocket mice may utilize this plant community. State 1 Phase 1.2 – Curleaf Mountain-Mahogany/ Sandberg Bluegrass/ Mountain Brome/ Slender Wheatgrass Plant Community: This plant community is the result of improper grazing management and no fire. The insect community would be similar to that in State 1 Phase 1.1. The reptile community would be similar to that in State 1 Phase 1.1. The diverse vertical structure offers habitat for many bird species including mountain bluebird, rock wren, grouse, waxwings, and flycatchers. The hedging of mahogany and bitterbrush would reduce the availability of winter forage for mule deer and elk. The site would still provide thermal and young of year cover for mule deer and elk. A small mammal population including golden-mantled ground squirrels, jackrabbits, deer mice, and Great Basin pocket mice would utilize this plant community. State 1 Phase 1.3- Bluebunch Wheatgrass/ Mountain Brome/ Slender Wheatgrass/ Sandberg Bluegrass/ Western Wheatgrass Plant Community: This phase has developed due to fire. The plant community, dominated by herbaceous vegetation with no mahogany, sagebrush, or bitterbrush provides less vertical structure for animals. Insect diversity would be reduced with the loss of most shrubs but a native forb plant community similar to State 1 Phase 1.1 would still support select pollinators. Encroachment of rabbitbrush and mountain snowberry would add spring and summer pollinator habitat and vertical structure to the site. Until mountain snowberry is established diversity and populations of reptiles would be reduced or excluded. This plant community

provides limited brood-rearing habitat for sage-grouse if the site is adjacent to sagebrush cover. The dominant herbaceous vegetation improves habitat for grassland avian species (horned lark and western meadowlark). Mountain snowberry would provide fair forage for mule deer and elk. Winter habitat for mule deer and elk would be reduced or eliminated with the loss of mahogany and bitterbrush. Small mammal populations would be similar to those in State 1 Phase 1.1 and 1.2. The fruit of mountain snowberry provides food for ruffed grouse, magpies, and small mammals. State 1 Phase 1.4 – Curlleaf Mountain-Mahogany/ Mountain Brome/ Nevada Bluegrass/ Bluebunch Wheatgrass/ Utah Juniper Plant Community: This plant community is the result of a lack of fire. An increase in canopy cover of junipers results in a sparse herbaceous understory and a reduction of mahogany. A reduced herbaceous understory results in lower diversity and numbers of insects. The reptile community will be similar to the one in State 1 Phase 1.1, and includes sagebrush lizard and western rattlesnake. The reduced diversity of insects and understory cover may reduce quality of food and cover for reptile populations. As juniper and mountain big sagebrush increase, habitat for Brewer's sparrow, sage thrasher, and sage sparrow may increase. The plant community provides forage habitat for mule deer and elk. Quality of winter forage for mule deer and elk is reduced due to the loss of vigor and production of mahogany and antelope bitterbrush. As juniper encroachment occurs, the site will continue to provide thermal cover and young of year cover for large mammals. A small mammal population including golden-mantled ground squirrels, jackrabbits, deer mice, and Great Basin pocket mice would utilize this plant community. Grazing Interpretations. This site is poor for livestock grazing due to the steep slopes, lack of desirable forage, and dense stand of curlleaf mountain mahogany. Estimated initial stocking rate will be determined with the landowner or decision-maker. They will be based on the inventory which includes species, composition, similarity index, production, past use history, season of use, and seasonal preference. Calculations used to determine estimated initial stocking rate will be based on forage preference ratings.

Hydrological functions

Soils in this site are in hydrologic group D.

Recreational uses

This site appeals to some people with regard to aesthetics and natural beauty. It is a good site for hunting, but it is hard to see animals due to the dense areas of curlleaf mountain mahogany where deer and other game can find cover. Steep slopes and surface stones severely limit hiking, picnicking, and camping.

Wood products

Curlleaf mountain mahogany furnishes some fence posts and stays. Firewood can be harvested, but the wood is difficult to cut after it is dry. Knick-knacks and other novelties can be made from this wood.

Other products

none.

Other information

Field Offices American Falls Blackfoot Burley Driggs Ft. Hall Idaho Falls Malad Pocatello Rexburg Soda Springs St. Anthony Revision Notes: "Previously Approved" Provisional This Provisional ecological site concept has passed Quality Control (QC) and Quality Assurance (QA) to ensure that the site meets the 2014 NESH standards for a Provisional ecological site description. This is an updated "Previously Approved" ESD that represents a first-generation tier of documentation that, prior to the release of the 2014 National Ecological Site Handbook (NESH), met all requirements as an "Approved" ESD as laid out in the 1997 (rev.1, 2003) National Range and Pasture Handbook (NRPH). The document fully described the Reference State and Community Phase in the State-and-Transition model. All other alternative states are at least described in narrative form. The "Previously Approved" ESD has been field-tested for a minimum of five years and is a proven functional document for conservation planning. The "Previously Approved" ESD does not contain all tabular and narrative entries as required in the current "Approved" level of documentation, but it is expected that the "Previously Approved" ESD will continue refinement toward an "Approved" status. Site Development and Testing Plan: Future work, as described in a Project Plan, is necessary to validate the information in this Provisional Ecological Site Description. This will include field activities to collect low-, medium-, and high-intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. The final field review, peer review, quality control, and quality assurance reviews of the ESD will be required to produce the final document.

Inventory data references

Information presented here has been derived from NRCS clipping and other inventory data. Also, field knowledge of range-trained personnel was used. Those involved in developing this site description include: Dave Franzen, co-owner, Intermountain Rangeland Consultants, LLC Jacy Gibbs, co-owner, Intermountain Rangeland Consultants, LLC Jim Cornwell, Range Management Specialist, IASCD Brendan Brazee, State Rangeland Management Specialist, NRCS, Idaho Lee Brooks, Range Management Specialist, IASCD Kristen May, Resource Soil Scientist, NRCS, Idaho

Other references

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USDI Bureau of Land Management, US Geological Survey; USDA Natural Resources Conservation Service, Agricultural Research Service; Interpreting Indicators of Rangeland Health. Technical Reference 1734-6; Version 4-2005.

Approval

Kirt Walstad, 2/13/2025

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	05/14/2008
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** rills are rare on this site due to the coarse surface fragments. If they are present they are likely to occur immediately following a wildfire and in areas with less surface stones.
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2. **Presence of water flow patterns:** water-flow patterns are rare on this site due to short slope lengths between rocks. When they occur they are short and disrupted by cool season grasses, tall shrubs and surface stones. They are not extensive.
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3. **Number and height of erosional pedestals or terracettes:** both are rare on this site. In areas where rills and flow patterns are present, a few pedestals may be expected.
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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** ranges from 20-40% but more data is needed.
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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:** does not occur on this site.
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7. **Amount of litter movement (describe size and distance expected to travel):** fine litter in the interspaces may move up to 3 feet following a significant run-off event. Coarse litter generally does not move. Litter can be trapped by surface stones.
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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):** values should range from 2 to 4 but needs to be tested.
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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** structure ranges from weak and moderate very fine and fine granular to moderate coarse platy to weak fine and medium and moderate very fine and fine subangular blocky. Soil organic matter (SOM) ranges from 0.5 to 4 percent. Surface color is very dark brown to very dark grayish brown to grayish brown. The A or A1 horizon is typically 2 to 8 inches thick.
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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** the tree-like canopy of curleaf mountain mahogany intercepts raindrops and therefore reduces that impact on the soil surface. Bunchgrasses, especially deep-rooted perennials and surface stones slow run-off and increase infiltration. Tall shrubs accumulate snow in the interspaces.
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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):** not 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: tree-like shrubs

Sub-dominant: cool season deep-rooted bunchgrasses

Other: tall shrubs

Additional: perennial forbs-shallow rooted bunchgrasses

13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence): mortality of curleaf mountain mahogany is usually the result of insect infestations or fire. Outbreaks of a curleaf mountain mahogany defoliating moth *Stamnodes animata*, occur at infrequent intervals. Two consecutive years of severe defoliation can cause curleaf mountain mahogany mortality.
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14. Average percent litter cover (%) and depth (in): it ranges from 10-20% but additional data is needed.
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15. Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production): is 1950 pounds per acre (2184 kg/ha) in a year with normal precipitation and temperatures.
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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: includes shade intolerant species such as cheatgrass (at lower elevations), bulbous bluegrass, whitetop, musk and scotch thistle, and diffuse and spotted knapweed when the canopy has been altered or removed.
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17. Perennial plant reproductive capability: all functional groups have the potential to reproduce most years.
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