Ecological site F030XC292NV
LIMESTONE SLOPES

Last updated: 4/26/2024
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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.

Ecological site concept

This forest site occurs on mountain backslopes. Slopes range from 15 to 75 percent, but are typically 30 to 50 percent. Elevations are 7000 to 8800 feet. Soils associated with this forest site are moderately deep, well drained and formed in colluvium and residuum from limestone and dolomitic limestone. The soils of this site are loamy-skeletal with 50 to 80 percent rock fragments by volume, mainly gravels and cobbles.

Associated sites

F030XC293NV	**QUARTZITE SLOPES** PIPOS/ARTRV/POFE

Similar sites

F030XC293NV	**QUARTZITE SLOPES** PIPOS/ARTRV/POFE [More productive, ARTRV dominant shrub]

Table 1. Dominant plant species

Tree	(1) *Pinus ponderosa ssp. scopulorum*
Shrub	(1) *Artemisia nova*
Herbaceous	(1) *Poa fendleriana*

Physiographic features

This forest site occurs on mountain backslopes. Slopes range from 15 to 75 percent, but are typically 30 to 50 percent. Elevations are 7000 to 8800 feet. Soils associated with this forest site are moderately deep, well drained and formed in colluvium and residuum from limestone and dolomitic limestone. The soils of this site are loamy-skeletal with 50 to 80 percent rock fragments by volume, mainly gravels and cobbles.

This site is part of group concept F030XC287NV.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope
Flooding frequency	None
Ponding frequency	None
Elevation	2,130 – 2,680 m
Slope	20 – 80 %

Climatic features

The climate is semi-arid with warm, dry summers and cold, moist winters. Precipitation is greatest in the winter with a lesser secondary peak in the summer, typical of the Mojave Desert transitional to the Great Basin. Average annual precipitation is approximately 13 to 15 inches. Mean annual air temperature is 54 F. The average frost free period is 50 to 150 days.

Table 3 Representative climatic features

Frost-free period (average)	150 days
Freeze-free period (average)	
Precipitation total (average)	380 mm

Influencing water features

There are no influencing water features associated with this ecological site.

Soil features

Soils associated with this forest site are moderately deep, well drained and formed in colluvium and residuum from limestone and dolomitic limestone. The soils of this site are loamy-skeletal with 50 to 80 percent rock fragments by volume, mainly gravels and cobbles. Runoff is very high, and saturated hydraulic conductivity is moderately high. Soils are characterized by a mollic epipedon from 0 to 30 inches, a calcic horizon from 7 to 35 inches, lithic contact beginning at 35 inches and aridic moisture regime bordering on ustic. The official soil series correlated to this ecological site includes Sawmillcan, a loamy-skeletal, carbonatic, mesic Pachic Calciustoll.

Table 4. Representative soil features

Parent material	(1) Colluvium – limestone (2) Residuum – dolomite
Surface texture	(1) Very gravelly loam
Family particle size	(1) Loamy

Drainage class	Well drained
Permeability class	Very slow
Soil depth	50 – 100 cm
Surface fragment cover <=3"	50 – 60 %
Surface fragment cover >3"	10 %
Available water capacity (0-101.6cm)	2.54 – 7.62 cm
Calcium carbonate equivalent (0-101.6cm)	30 – 50 %
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	0 – 10
Soil reaction (1:1 water) (0-101.6cm)	7.6 – 10
Subsurface fragment volume <=3" (Depth not specified)	40 – 70 %
Subsurface fragment volume >3" (Depth not specified)	10 – 30 %

Ecological dynamics

The plant communities of this site are dynamic in response to changes in disturbance regimes and weather patterns. Disturbances, such as fire, play an important role in all forest ecosystems. Important processes that are regulated by fire include regeneration and reproduction, seedbed preparation, competition reduction and thinning to maintain stand health (Spurr and Barnes 1964). Rocky Mountain ponderosa pine is found throughout the West and grows on discontinuous mountains, plateaus, and canyons. A possible explanation for its limited and spotty distribution is correlated to the distribution of sites that receive summer rainfall (Oliver and Ryker 1992). Ponderosa pine seedlings are able to grow taproots that extend greater than 20 inches within a few months of germination (Oliver and Ryker 1992). This ability is essential for survival in desert ecosystems. Rocky mountain ponderosa pine (Pinus ponderosa var.

scopulorum) differs from variety ponderosa with its shorter needles, fewer needles per fascicle, germination rate and root growth capacity (Krugman and Jenkinson 2008). Investigation to the vast genetic diversity of P. ponderosa suggests there are five major geographic races, including two distinct races in variety scopulorum. Northern sources of variety scopulorum are characterized by relatively good growth and frost resistance. The southern sources, which occur in Nevada, are slower growing but also frost resistant (Krugman and Jenkinson 2008). Rocky Mountain ponderosa pine has migrated into the Great Basin following the ice ages by way of the Southern Rocky Mountains. Rocky Mountain ponderosa pine never attains the size of the typical variety (P. ponderosa var. ponderosa).
Soils provide physical support, moisture and nutrients to the forest community. Trees have reciprocating effects on the soil. Since they tend to exist on site for extended periods of time, their roots typically extend deep into the subsoil and even into fractured bedrock influencing the rate of soil development. Considerable amounts of organic material are returned to the soil in the form of fallen litter and decaying roots. Increased organic matter on the soil surface, or litter layer, helps to keep moisture conditions more uniform. Insulation provided by the tree canopy and litter layer also reduces the temperature fluctuation from day to night (Fisher and Binkley 2002). Seedlings of ponderosa pine grow best with warm days and warm nights. Root growth of ponderosa pine is highly dependent on soil temperature. Low soil temperatures result in low metabolic activity and membrane permeability which limit water and nutrients uptake (Spurr and Barnes 1964).
Biogeochemical cycling in semi-arid forest system is controlled by moisture availability and fire. The role of water is more important in humid systems, which are largely affected by leaching. A review of the literature shows the post fire nitrogen fixation is more important than atmospheric deposition and leaching. Fire affects the nitrogen pool of a forest in 2 ways: 1) due to volatilization during the fire and 2) the influx of nitrogen fixing vegetation following the fire. Increases of nitrogen immediately after fire are attributed to the release of ammonium (NH_4^+) which takes place at temperatures above 100°C (Johnson et al. 1998). Nitrogen is considered to be a limiting nutrient in this system and the plant community will rapidly respond to inputs of nitrogen. Temporary increases in available nitrogen decrease to pre-burn levels within 5 to 12 years after fire (Johnson et al. 1998). The importance of fire and post fire nitrogen fixation will continue to increase due to changes in fire frequency driven by non-native annuals and the buildup of fuels during decades of fire suppression.

Fire Ecology: Rocky Mountain ponderosa pine is long-lived with individual trees capable of living to 700+ years. Historically, stands were open and comprised of varied age class distribution that evolved with the occurrence of frequent surface fires and the occasional stand-replacing crown fire. Surface fires reoccurred every 5 to 30 years, this maintained open-growth, park-like stands. Stand replacing fires were less common, estimates range from 60 to 160 years (Howard 1993). Mature trees are very resistant to fire. Adaptations include self-pruning branches, thick bark, thick bud scales, tight needle bunches and a deep rooting habit. Seedlings and saplings are susceptible to fire. Periodic ground fires remove heavy litter, duff and unwanted juveniles that accumulate in the forest understory. Fire also prepares the seed bed for regeneration (Howard 1993). Fuel loading in stands of ponderosa pine vary depending on age class, stand structure and understory composition. In the absence of naturally reoccurring wildfire had led to large accumulations of fuels in some ponderosa pine forests and an increase of shade tolerant, less fire resistant, less desirable tree species in the understory. Low severity fires generally kill trees less than 6 inches dbh. Trees infected with dwarf-mistletoe or other diseases are more susceptible to mortality. Rocky Mtn. Juniper and white fir are intolerant of fire. Even low severity fires result in high rates of mortality. Muttongrass easily survives low severity fire, but appears to be harmed by severe fire. The seeds of Ross' sedge germinate after heat treatment and rhizomes commonly survive fires. Squirreltail can be top killed by fire, but regenerates from the root crown and from seed. Black sagebrush is killed by all fire severities. Reestablishment occurs solely through seed. Wax currant is described as a weak sprouter this is killed by severe fire. Mountain snowberry commonly sprouts from the root crow following fire. Rabbitbrush is top killed by fire. It easily reestablishes by sprouting and by seed. It may increase in cover following wildfire or other disturbance. Purple sage is tolerant of fire and will sprout following burning.

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 (%)
Grass/Grasslike					
1	**Primary Perennial Grasses**			12-33	
	muttongrass	POFE	*Poa fendleriana*	9-16	–
	Ross' sedge	CARO5	*Carex rossii*	2-9	–
	squirreltail	ELEL5	*Elymus elymoides*	2-9	–
2	**Secondary Perennial Grasses**			1-4	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	1-2	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	1-2	–
Forb					
3	**Perennial**			17-39	
	Nuttall's linanthus	LENUP	*Leptosiphon nuttallii ssp. pubescens*	9-16	–

	Wyoming Indian paintbrush	CALI4	*Castilleja linariifolia*	2-9	–
	Clokey's fleabane	ERCL	*Erigeron clokeyi*	2-9	–
	Cooper's rubberweed	HYCO2	*Hymenoxys cooperi*	1-3	–
	Virgin River cryptantha	CRVI5	*Cryptantha virginensis*	1-3	–
	pinewoods lousewort	PESE2	*Pedicularis semibarbata*	1-3	–
	dwarf phlox	PHCO11	*Phlox condensata*	1-3	–
Shrub/Vine					
4	**Primary Shrubs**			45-95	
	black sagebrush	ARNO4	*Artemisia nova*	17-40	–
	wax currant	RICE	*Ribes cereum*	9-16	–
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	9-16	–
5	**Secondary Shrubs**			11-45	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	2-9	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	2-9	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	2-9	–
	purple sage	SADO4	*Salvia dorrii*	2-9	–
	spineless horsebrush	TECA2	*Tetradymia canescens*	2-9	–
Tree					
6	**Evergreen**			7-27	
	white fir	ABCO	*Abies concolor*	2-9	–
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	2-9	–
	ponderosa pine	PIPOS	*Pinus ponderosa var. scopulorum*	2-9	–
	Great Basin bristlecone pine	PILO	*Pinus longaeva*	1-4	–
	singleleaf pinyon	PIMO	*Pinus monophylla*	1-4	–
	curl-leaf mountain mahogany	CELE3	*Cercocarpus ledifolius*	1-4	–
	Utah juniper	JUOS	*Juniperus osteosperma*	1-4	–

Table 6. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height M	Canopy Cover (%)	Diameter Cm	Basal Area (square M/hectare)
Tree							
ponderosa pine	PIPO	*Pinus ponderosa*	Native	–	60-70	–	–
Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	Native	–	10-15	–	–
white fir	ABCO	*Abies concolor*	Native	–	10-15	–	–
Utah juniper	JUOS	*Juniperus osteosperma*	Native	–	1-3	–	–
singleleaf pinyon	PIMO	*Pinus monophylla*	Native	–	1-3	–	–
curl-leaf mountain mahogany	CELE3	*Cercocarpus ledifolius*	Native	–	1-3	–	–
Great Basin bristlecone pine	PILO	*Pinus longaeva*	Native	–	1-3	–	–

Table 7. Community 1.2 plant community composition

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

Table 8. Community 1.3 plant community composition

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

Table 9. Community 1.4 plant community composition

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

Table 10. Community 1.5 plant community composition

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

Table 11. Community 1.6 plant community composition

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

Animal community

This site has limited suitability for livestock grazing, although animals may use this site during the hot summer months. Herbaceous forage production is quite low and the site is not easily accessed because due to steep slopes and lack of adequate water resources. The amount and nature of the understory vegetation in a forestland is highly dependent on the amount and duration of shade provided by the overstory canopy. Significant changes in kind and abundance of plants occur as the canopy changes, often regardless of grazing use. Muttongrass is a valuable forage resource. It has been rated excellent forage for domestic cattle and horses. Ross's sedge value as a forage plant varies depending on the site. It has been rated fair for domestic sheep, horses and cattle. Bottlebrush squirreltail is palatable to domestic livestock. Winter months show greatest use and it generally increases under heavy grazing. Dominant shrubs provide additional foraging resources on this ecological site. Black sagebrush is used by domestic livestock, it is considered to be highly palatable to domestic sheep. Cattle and domestic goats browse black sagebrush to a lesser degree. Wax currant provides poor to fair browse for domestic livestock, although it can be of great importance when little else is available. Mountain snowberry is readily eaten by all classes of livestock. Its ability to sprout allows it to persist and even increase under moderate browsing pressure. Stocking rates vary with such factors as kind and class of grazing animal, season of use and fluctuations in climate. Actual use records for individual sites, a determination of the degree to which the sites have been grazed, and an evaluation of trend in site condition offer the most reliable basis for developing initial stocking rates. The forage value rating is not an ecological evaluation of the understory as is the range condition rating for rangeland. The forage value rating is a utilitarian rating of the existing understory plants for use by specific kinds of grazing animals. Wildlife Interpretations: This area is high-use habitat for a variety of birds including, owls and goatsuckers, swifts, humming birds, wood peckers, flycatchers, nuthatches, thrushes and finches. It also has moderate forage value for big game during the summer, fall, and early winter, especially in areas with wax currant and other browse species in the understory. It is used occasionally by various other song birds, rodents and associated predators natural to the area. Many upland wildlife species find valuable foraging and habitat resources on this ecological site. Several wildlife species utilize bottlebrush squirreltail. It provides important forage for ground squirrels, cottontails and black-tailed jackrabbits and less important forage for mule deer. Muttongrass provides good forage ungulates. The seeds and leaves are also used by a variety of birds. Ross's sedge provides occasional forage for mule deer. Dominant shrubs provide additional foraging resources on this ecological site. Black sagebrush provides important foraging resource for wild ungulates. In some areas it is the most important winter forage resource for mule deer and pronghorn antelope. Birds such as sparrows, sage thrashers and sage grouse use black sagebrush habitats extensively for food and cover. It is also used by rodents, small mammals and associated predators like golden eagles. Wax currant provides food and cover for wildlife. It is only fair to poor browse for deer, but is important on ranges were little else is available. Mountain snowberry provides important forage for deer on high elevation summer ranges. Snowberry is one of the first species to leaf out and therefore it is heavily used in the spring. Snowberry is capable of sprouting and therefore can persist and even increase under moderate browsing pressure. Prolonged browsing can result in reduced densities. Rocky Mountain juniper provides fair winter forage, excellent escape cover and good fawning cover. White fir provides spring forage for mule deer and good cover for many other wildlife species.

Hydrological functions

The soils associated with this site are characterized by very high runoff and very slow permeability. The potential for erosion is sever depending on the slope and amount of rock fragments on the soil surface.

Recreational uses

This site has high aesthetic value and provides a variety of recreational opportunities such as hiking, camping and permitted hunting, as well as, nature study and bird watching. Steep slopes and the fragile soil-vegetation complex, however, inhibit many other forms of recreation such as the use of off-road vehicles.

Wood products

Fuelwood Production: 27 to 43 cords per acre for stands averaging 40 to 50 feet in height and 200 years of age with a medium canopy cover (USDA 1935). There are about 213,750 gross British Thermal Units (BTUs) heat content per cubic foot of ponderosa pine wood. Solid wood volume in a cord varies but usually ranges from 65 to 90 cubic feet. Assuming an average of 75 cubic feet of solid wood per cord, there are about 16 million BTUs of heat value in a cord of ponderosa pine wood. MANAGEMENT GUIDES AND INTERPRETATIONS 1. LIMITATIONS AND CONSIDERATIONS a. Potential for sheet and rill erosion is slight to moderate depending on slope. b. Severe equipment limitations due to steep slopes. 2. ESSENTIAL REQUIREMENTS a. Protect soils from accelerated erosion. b. Manage for protection of wildlife habitat. c. Adequately protect from uncontrolled burning. 3. SILVICULTURAL PRACTICES a. Traditional silvicultural treatments, such as harvest cutting, are not reasonably applied on this site due to poor site quality and severe limitations for equipment and tree harvest. This site has potential for using hand-crews for thinning and improvement cuttings to remove diseased and overcrowded trees. Improvement cuttings cut selectively or in small patches size (dependent upon site conditions) to

enhance forage production, wildlife habitat and forest health. 1) Thinning and improvement cutting - Removal of poorly formed, diseased and low vigor trees for fuelwood. 2) Slash Disposal - broadcasting slash improves reestablishment of native understory herbaceous species and establishment of seeded grasses and forbs after tree harvest. b. Fire hazard - Fire usually not a problem in well-managed, mature stands.

Other products

The fruit of wax currant is used for making jam, jelly and pie. Indian tribes native to western America used currants for making pemmican and it is currently grown as an ornamental.

Table 12. Representative site productivity

Common Name	Symbol	Site Index Low	Site Index High	CMAI Low	CMAI High	Age Of CMAI	Site Index Curve Code	Site Index Curve Basis	Citation
ponderosa pine	*PIPO*	38	50	29	38	100	–	–	

Type locality

Location 1: Clark County, NV	
Township/Range/Section	T15S R60E S34
UTM zone	N
UTM northing	4050052
UTM easting	657934
Latitude	36° 34′ 58″
Longitude	115° 14′ 4″
General legal description	Sheep Peak USGS 7.5 minute topographic quadrangle. Approximately 0.8mi from Sheep Peak in the Sheep Range found in the Desert National Wildlife Refuge. Located north-east of Highway 95 and west of Highway 93 Clark County, Nevada.

Other references

Fisher, R. and D. Binkley. 2002. Ecology and Management of Forest Soils. John Wiley & Sons, New York, NY.
Howard, J. L. 2003. Pinus ponderosa var. scopulorum. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer) Available:http://www.fs.fed.us/database/feis/
Johnson, D.W., R.B. Susfalk, R.A. Dahlgren and J.M. Klopatek. 1998. Fire is more important than water for nitrogen fluxes in semi-arid forests. Environmental Science and Policy. 1:79-86.
Krugam, S.L. and J.L. Jenkinson. 2008. Pinus L. Woody Plant Seed Manual. USDA FS Agriculture Handbook 727. P819.
Lanner, R.M. 1984. Trees of the Great Basin. University of Nevada Press, Reno NV.
Scher, J.S. 2002. Juniperus scopulorum. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/
Meyer, W.H. 1961. Yield of even-aged stands of ponderosa pine. USDA Tech Bull 630. (revised 1961).
Oliver, W.W. and R.A. Ryker. 1992. “Pinus ponderosa Dougl. ex Laws.” FS INFO-Intermoutain Monthly Alert. April 1992. No 131:413-

423.
Spurr, S.H. and B.V. Barnes. 1964. Forest Ecology. John Wiley and Sons. New York, N.Y.
USDA. 1935. Instructions for the scaling and measurement of National Forest Timber Misc. Pub. 225.
USDA-NRCS. 2000 National Forestry Manual – Part 537. Washington, D.C.
USDA-NRCS. 2004 National Forestry Handbook, Title 190. Washington, D.C.
Zouhar, Kris. 2001. Abies concolor. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/

Contributors

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Approval

Kendra Moseley, 4/26/2024

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	08/27/2026
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

   _____

2. **Presence of water flow patterns:**

   _____

3. **Number and height of erosional pedestals or terracettes:**

   _____

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

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

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

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7. **Amount of litter movement (describe size and distance expected to travel):**

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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):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and 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):**

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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:

    Sub-dominant:

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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14. **Average percent litter cover (%) and depth (in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

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17. **Perennial plant reproductive capability:**
