USDA Natural Resources
Conservation Service

Ecological site R042CY158NM
Very Shallow

Last updated: 10/21/2024
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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.

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

Ecological site concept

This site occurs on upland plains, and on summits of hills and ridges. Slopes vary from 1 to 15 percent but are generally less than 9 percent.
The soils of this site are well-drained, and very shallow to shallow over unfractured limestone. Surface textures are cobbly loams, stony or rocky loams, and cobbly silt loams. Rock outcrop is a common feature on this site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Larrea tridentata* (2) *Acacia greggii*
Herbaceous	(1) *Bouteloua eriopoda*

Physiographic features

This site occurs on upland plains, on top slopes of hills and ridges where soil is very shallow over unfractured imestone. Slopes vary from 1 to 15 percent but are generally less than 9 percent. Direction of slope varies but is not significant. Elevations range from 4,000 to 7,000 feet.

Table 2. Representative physiographic features

Landforms	(1) Plain (2) Hill (3) Ridge
Flooding frequency	None
Ponding frequency	None
Elevation	1,219–2,134 m
Slope	1–15%
Aspect	Aspect is not a significant factor

Climatic features

The climate of this area is “semi-arid continental.”

Annual average precipitation ranges from 11 to 19 inches. Variations of 5 inches, more or less, are not uncommon. Approximately 70 percent of this occurs from May through October. Most of the summer precipitation comes in the form of high-intensity, short- uration thunderstorms. Winter moisture is usually negligible.

Temperatures are characterized by distinct seasonal changes and large annual and diurnal temperature changes. The average annual temperature ranges from 55 degrees to 60 degrees, with extremes of 20 degrees below zero in the winter to 110 degrees in the summer not uncommon.

The average frost-free season is 170 to 189 days. The last killing frost is in early April and the first killing frost is in mid October.

Both temperature and precipitation favor warm-season species. Approximately 40 percent of the precipitation is favorable to cool season growth at higher elevations. Due to the shallow soil profile, the vegetation on this site responds well to short duration gentle rains. Heavy rains produce excess runoff which can cause flash flooding and soil erosion. Strong winds blow from February through June from the west and southwest. This causes the soil to dry during a critical period for cool season plant growth.

Climate data was obtained from http://www.wrcc.sage.dri.edu/summary/climsmnm.html web site.
Data interpreted utilizing NM NRCS Climate Summarizer spreadsheet.

Table 3. Representative climatic features

Frost-free period (average)	189 days
Freeze-free period (average)	211 days
Precipitation total (average)	483 mm

Influencing water features

This is an upland site, and is not associated with water features or wetlands. During heavy rain events, this site may receive run-on moisture from landforms above and contribute runoff to landforms below.

Soil features

The soils of this site are well-drained, and very shallow to shallow over unfractured limestone. Surface textures are cobbly loams, stony or rocky loams, and cobbly silt loams. The limestone bedrock is normally 6 to 10 inches with outcropping common. Permeability is moderately slow and available water holding capacity is low.

Characteristic soils are:
Deama cobbly loam 0 to 5 percent
Ector cobbly loam 0 to 9 percent
Deama gravelly loam 0 to 5 percent

Table 4. Representative soil features

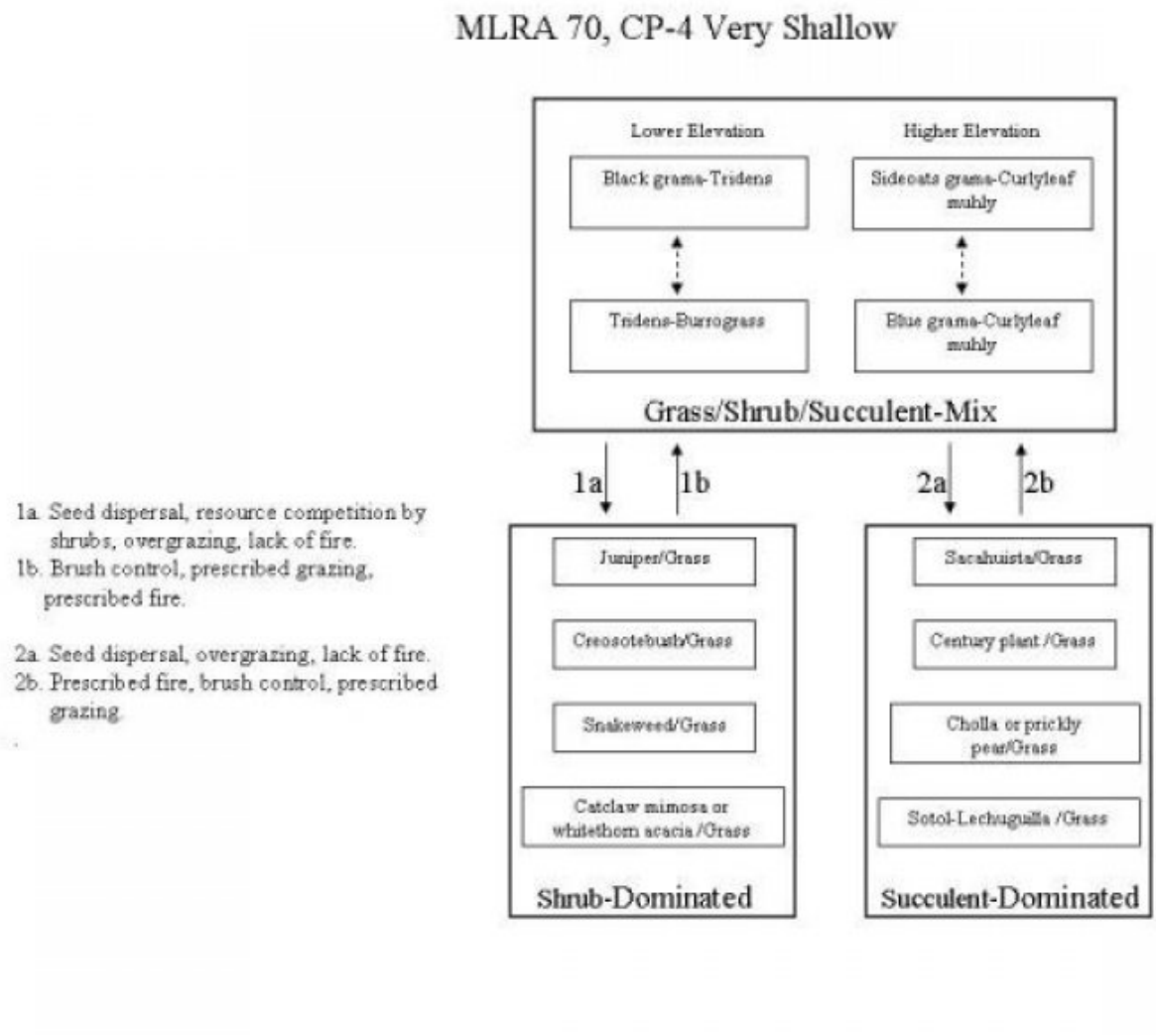
Parent material	(1) Alluvium–limestone
Surface texture	(1) Gravelly loam (2) Cobbly loam (3) Stony loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderate
Soil depth	20–46 cm

Ecological dynamics

MLRA-70, CP-4: Very Shallow

Overview
This site typically occurs at the transition zone between SD-3 and CP-4, as a repeating pattern of low elongated hills or ridges flanked by lower lying Swales, Draws, or Loamy sites. The very Shallow site is differentiated from associated sites by shallow depth (< 20 inches) to limestone bedrock, and slopes less than 15 percent. Elevation ranges from 3,700 to 4,700 feet. It also occurs at the higher elevations of CP-4 (5,000 to 7,000 feet) as nearly level to gently sloping summits of Limestone Hills. The historic plant community of the Very Shallow site is a grassland/shrub/succulent-mix, dominated by grasses, with shrubs/succulents common and evenly distributed. Black grama is the dominant grass species at low to mid elevations with sideoats grama dominating at higher elevations. Dispersal of shrub or succulent seed by wildlife or livestock may initiate the transition to an alternate state. Resource competition (especially for available water) may be a factor contributing to the transition to a shrub-dominated state. Overgrazing can reduce grass cover, effect a change in grass species dominance, and may facilitate the transition to a shrub or succulent-dominated state. Suppression of natural fire regimes may also play a part in the transition to shrub or succulent dominance.

State and transition model



State 1
Grass/Shrub/Succulent-Mix

This state represents the most ecologically stable conditions in terms of resistance to erosion. Moreover, this state has the highest potential for productivity and plant diversity.

Community 1.1

Grass/Shrub/Succulent-Mix

State Containing Historic Plant Community Grass/Shrub/Succulent-Mix: Elevation and moisture-temperature gradients are important factors in determining production and composition of plant communities in the CP-4 land resource unit. Elevations range from 4000 to 7000 feet and production and composition may vary widely within this range. Black grama is the dominant grass species at the lower to mid-elevation ranges. Tridens species are sub-dominant to black grama. Common shrubs/succulents include creosotebush, catclaw mimosa, broom snakeweed, yucca species, cholla, lechuguilla, and sotol. At higher elevations sideoats grama or blue grama are the dominant grasses, with curlyleaf muhly as the sub-dominant. Sacahuista, century plants, cholla, broom snakeweed, and juniper are shrubs/succulents characteristic of mid to higher elevations. Mismanagement of this site will cause a decrease in black grama, sideoats grama, and blue grama, and an increase in tridens, burrograss, threeawns, and fluffgrass. Continued loss of grass cover in conjunction with dispersal of shrub and succulent seed may initiate the transition to a state dominated by shrubs or succulents. Diagnosis: Grass cover is uniformly distributed, however, rock fragments and bare ground make up a large percent of the total ground cover, and grass production during unfavorable years may only average 100-200 pounds per acre. Shrubs/succulents are common with canopy cover averaging six percent.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	381	448	493
Shrub/Vine	151	213	269
Forb	78	95	112
Total	**610**	**756**	**874**

Table 6. Ground cover

Tree foliar cover	0-3%
Shrub/vine/liana foliar cover	0%
Grass/grasslike foliar cover	15-25%
Forb foliar cover	3-10%
Non-vascular plants	0%
Biological crusts	0%
Litter	5-25%
Surface fragments >0.25" and <=3"	5-25%
Surface fragments >3"	10-22%
Bedrock	0%
Water	0%
Bare ground	20-40%

Figure 5. Plant community growth curve (percent production by month). NM4608, R070DY158NM Very Shallow Reference State. R070DY158NM Very Shallow Reference State.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	2	6	8	10	15	25	25	8	1	0	0

State 2
Shrub-Dominated

This state is dominated by shrubs.

Community 2.1
Shrub-Dominated

Shrub-Dominated: This state is characterized by the predominance of shrubs, with perennial grasses as the subordinate component. Different species of shrubs may come to dominate depending on elevation and available soil moisture. Typically creosotebush, catclaw mimosa, and whitethorn acacia are more common on lower to mid elevations, while juniper is often found at mid to upper elevations. Broom snakeweed may be the dominant or sub-dominant component throughout the elevation range. The elevation range for juniper also varies depending on the species. Pinchot juniper is found at lower elevations than oneseed or alligator juniper. Tridens are typically the dominant grass species at lower to mid elevations and blue grama is the dominant grass at higher elevations. Diagnosis: Shrubs are found at increased densities relative to the grass/shrub/succulent mix. Grass cover is variable, ranging from fairly uniform to patchy with large connected bare areas present. Tridens and blue grama are the dominant grasses, and burrograss, threeawns, and fluffgrass are found at increased densities. Low slopes and the high amount of rock fragments on the soil surface help limit erosion. Transition to Shrub-Dominated (1a) Dispersal of shrub seed by wildlife and livestock, loss of grass cover due to overgrazing or extended periods of drought, resource competition by shrubs, and suppression of natural fire regimes have all been cited as causes for shrub encroachment. 1, 2, 4, 5, 7, 13. Loss of adequate grass cover reduces fine fuels necessary to carry fire, and can give a competitive advantage to shrub seedling establishment, by providing a competition free area for establishment and growth. Key indicators of approach to transition: Decrease or change in composition or distribution of grass cover. Increase in size and frequency of bare patches. Increase in amount of shrub seedlings. Transition back to Grass/Shrub/Succulent-Mix (1b) Brush control is necessary to re-establish grass dominance, however the success of re-establishing grasses may be limited by the low amount of residual perennial grasses in the shrub inter-spaces prior to brush control efforts. Prescribed grazing will help to ensure adequate rest following brush control and proper forage utilization after grass recovery. Periodic use of prescribed fire may help in maintaining a grass-shrub mix.

State 3
Succulent-Dominated

This state is dominated by succulents.

Community 3.1
Succulent-Dominated

Succulent-Dominated: This state is characterized by an increase in succulents relative to the historic plant community. Succulent species that increase on this site include sacahuista, yucca spp., sotol, century plant, lechuguilla, cholla, and prickly pear. Sacahuista tends to dominate on the mid-to-higher elevations. 3 Many of these succulents, especially sotol, century plant, and lechuguilla occur together as co-dominants in localized communities, in other cases single species may dominate. Historic overgrazing by sheep is often associated with heavy densities of cholla. Many of the succulents also occur as co-dominants or sub-dominants with shrubs, such as juniper. Black grama, tridens, sideoats grama, and blue grama are the principal grasses. Diagnosis: Succulents are found at increased densities relative to the Grass/shrub/succulent-mix. Grass cover is variable ranging from fairly uniform and evenly distributed to patchy with large bare areas present. Grass species composition is similar to the communities found in the grass/shrub/succulent-mix, except on areas that were heavily overgrazed, where tridens, burrograss, threeawns, and fluffgrass may dominate. Transition to Succulent-Dominated (2a) Causal factors for transitions to a succulent- dominated state are similar to those for the transition to the Shrub-dominated state12. The transition to dominance by cholla and other succulents tends to occur on shallower soils than those that become dominated by shrubs. Unlike the transition to the shrub-dominated state, competition seems to be unimportant. Research has indicated that removal of cholla and prickly pear does not result in significant increases in grass production, 8, 6, 9 indicating low direct competition between some succulents and herbaceous understory plants. Although the drivers for the transition to a succulent dominated state are the same as those for the shrub dominated state, the difference in pathways may be related to plant morphology and edaphic features. Succulents have shallower root systems than most shrubs, 10 and therefore may be better adapted at extracting soil water and nutrients from soils that are less than ten inches to limestone bedrock. Key indicators of approach to transition: Decrease in litter cover Increases in bare patch size. Increase in the amount of succulent seedlings. Increased cover of succulents. Transition back to Grass/Shrub/Succulent-Mix (2b) Fire can be an effective means of controlling succulents provided adequate grass cover remains to carry fire.11 Brush control can be effective in

controlling succulents and improving forage access and livestock handling. Prescribed grazing will help ensure proper forage utilization and sustain grass cover.

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1				151–303	
	black grama	BOER4	*Bouteloua eriopoda*	151–303	–
2				39–78	
	sideoats grama	BOCU	*Bouteloua curtipendula*	38–76	–
3				78–191	
	tridens	TRIDE	*Tridens*	76–191	–
4				34–78	
	blue grama	BOGR2	*Bouteloua gracilis*	38–76	–
	dropseed	SPORO	*Sporobolus*	38–76	–
5				34–78	
	ring muhly	MUTO2	*Muhlenbergia torreyi*	38–76	–
	burrograss	SCBR2	*Scleropogon brevifolius*	38–76	–
6				34–78	
	threeawn	ARIST	*Aristida*	38–76	–
7				78–112	
	plains lovegrass	ERIN	*Eragrostis intermedia*	76–112	–
	curlyleaf muhly	MUSE	*Muhlenbergia setifolia*	76–112	–
8				17–34	
	common wolfstail	LYPH	*Lycurus phleoides*	16–38	–
9				17–34	
	Hall's panicgrass	PAHA	*Panicum hallii*	16–38	–
10	**Other Grasses**			17–34	
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	16–38	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	16–38	–
	silver bluestem	BOSA	*Bothriochloa saccharoides*	16–38	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	16–38	–
	squirreltail	ELELE	*Elymus elymoides ssp. elymoides*	16–38	–
	New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	16–38	–
	green sprangletop	LEDU	*Leptochloa dubia*	16–38	–
	mat muhly	MURI	*Muhlenbergia richardsonis*	16–38	–
	tobosagrass	PLMU3	*Pleuraphis mutica*	16–38	–
	little bluestem	SCSC	*Schizachyrium scoparium*	16–38	–
	plains bristlegrass	SEVU2	*Setaria vulpiseta*	16–38	–
Shrub/Vine					
11				17–34	
	catclaw mimosa	MIACB	*Mimosa aculeaticarpa var. biuncifera*	16–38	–

12				17–56	
	sacahuista	NOMI	*Nolina microcarpa*	16–53	–
13				17–34	
	century plant	AGAN4	*Agave angustifolia*	16–38	–
	sotol	DASYL	*Dasylirion*	16–38	–
	yucca	YUCCA	*Yucca*	16–38	–
14				6–17	
	tree cholla	CYIM2	*Cylindropuntia imbricata*	8–16	–
	pricklypear	OPUNT	*Opuntia*	8–16	–
15				17–34	
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	16–38	–
16	**Other shrubs**			17–34	
	lechuguilla	AGLE	*Agave lechuguilla*	16–38	–
	Bigelow sage	ARBI3	*Artemisia bigelovii*	16–38	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	16–38	–
	yerba de pasmo	BAPT	*Baccharis pteronioides*	16–38	–
	mountain mahogany	CERCO	*Cercocarpus*	16–38	–
	javelina bush	COER5	*Condalia ericoides*	16–38	–
	prairie clover	DALEA	*Dalea*	16–38	–
	jointfir	EPHED	*Ephedra*	16–38	–
	juniper	JUNIP	*Juniperus*	16–38	–
	ratany	KRAME	*Krameria*	16–38	–
	creosote bush	LATR2	*Larrea tridentata*	16–38	–
	algerita	MATR3	*Mahonia trifoliolata*	16–38	–
	oak	QUERC	*Quercus*	16–38	–
	sumac	RHUS	*Rhus*	16–38	–
Forb					
17				17–34	
	croton	CROTO	*Croton*	16–38	–
	buckwheat	ERIOG	*Eriogonum*	16–38	–
	pricklyleaf dogweed	THAC	*Thymophylla acerosa*	16–38	–
18				6–34	
	woolly groundsel	PACA15	*Packera cana*	8–38	–
19				6–22	
	fetid marigold	DYPA	*Dyssodia papposa*	8–22	–
	bladderpod	LESQU	*Lesquerella*	8–22	–
20	**Other forbs**			6–22	
	yarrow	ACHIL	*Achillea*	8–22	–
	woolly locoweed	ASMO7	*Astragalus mollissimus*	8–22	–
	desert marigold	BAMU	*Baileya multiradiata*	8–22	–
	machaeranthera	MAPIS	*Machaeranthera pinnatifida var. scabrella*	8–22	–
	woolly plantain	PLPA2	*Plantago patagonica*	8–22	–
	globemallow	SPHAE	*Sphaeralcea*	8–22	–

	pricklyleaf dogweed	THAC	*Thymophylla acerosa*	8–22	–
	vervain	VERBE	*Verbena*	8–22	–
	dyssodia	DYSSO	*Dyssodia*	8–22	–
	fleabane	ERIGE2	*Erigeron*	8–22	–

Inventory data references

Data collection for this site was done in
conjunction with the progressive soil surveys
within the Pecos-Canadian Plains and Valleys Major Land Resource Area of New Mexico (MLRA 70).

This site has been mapped and correlated with soils in the following soil surveys:
Otero, Eddy, Chaves, Lincoln

Other references

References

1. Archer, S., C. Scifres, C.R. Bassham, and R. Maggio. 1988. Autogenic succession in a subtropical savanna: conversion of grassland to thorn woodland. Ecological Monographs 58: 111-127.

2. Buffington, L.C., and C.H. Herbel. 1965. Vegetational changes on a semidesert grassland range from 1858 to 1963. Ecol. Monog. 35: 139-164.

3. Gehlbach, F.R. 1967. Vegetation of the Guadalupe Escarpment, New Mexico-Texas. Ecology. 48(3): 404-419.

4. Holechek, J. L., A. Tembo, D. Alipayou, [and others]. 1994. Long-term grazing influences on Chihuahuan Desert rangeland. The Southwestern Naturalist. 39: 342-349.

5. Johnsen, T. N., Jr. 1962. One-seeded juniper invasion of northern Arizona grasslands. Ecological Monographs. 32:187-207.

6. Kunst, C. R., R. E. Sosebee, and M. J. Dumesnil. 1988. Herbicidal control of cholla. Society of range Management. Abstract Papers. 41: 67.

Contributors

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Approval

Kendra Moseley, 10/21/2024

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	11/21/2024
Approved by	Kendra Moseley
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):**

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

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

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

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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

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

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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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:**
