

Ecological site DX035X03B826 Sandstone Upland 17-25" p.z. (PIPO)

Accessed: 05/19/2024

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.

MLRA notes

Major Land Resource Area (MLRA): 035X–Colorado Plateau

This ecological site occurs in Common Resource Area 35.8 - the Colorado Plateau Ponderosa Pine Forests

The Common Resource Area occurs within the Colorado Plateau Physiographic Province. Elevations range from 6800 to 8500 feet and precipitation averages 17 to 25 inches per year. Vegetation includes ponderosa pine, white fir, aspen, pinyon, juniper, Gambel oak, big sagebrush, ceanothus, blue elderberry, muttongrass, upland sedge, and big wildrye, mountain muhly, Arizona fescue, pine dropseed, and blue grama. The soil temperature regime ranges from mesic to frigid and the soil moisture regime is typic ustic. This unit occurs within the Colorado Plateau Physiographic Province and is characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys and deep canyons. Sedimentary rock classes dominate the plateau with volcanic fields occurring for the most part near its margin.

Associated sites

DX035X03B811	Sandy Loam Upland 17-25" p.z. (PIPO)
DX035X03B827	Sandstone Hills 17-25" p.z. (PIPO)
R035XH821AZ	Meadow 17-25" p.z.

Table 1. Dominant plant species

Tree	(1) <i>Pinus ponderosa</i> (2) <i>Quercus gambelii</i>
Shrub	(1) <i>Artemisia tridentata ssp. wyomingensis</i> (2) <i>Mahonia repens</i>
Herbaceous	(1) <i>Bouteloua gracilis</i> (2) <i>Muhlenbergia montana</i>

Legacy ID

F035XH826AZ

Physiographic features

This ecological site occurs on plateaus and mesas. Soils are typically shallow to sandstone with argillic horizons. The site can have small inclusions of moderately deep soils, or very shallow soils associated with rock outcrop. Slopes on the site range from 1 to 15 percent. The site is well drained and does not benefit significantly from run-on moisture from adjacent sites.

Table 2. Representative physiographic features

Landforms	(1) Plateau (2) Mesa
Flooding frequency	None
Ponding frequency	None
Elevation	2,225–2,591 m
Slope	0–15%
Aspect	Aspect is not a significant factor

Climatic features

Winter-summer moisture ratios are typically 70:30 on the west side of this LRU and shift to 60:40 on the east side. Late spring is usually the driest period, and early fall moisture can be sporadic. Summer rains fall from June through September; moisture originates in the Gulf of Mexico and creates convective, usually brief, intense thunderstorms. Cool season moisture from October through May tends to be frontal; it originates in the Pacific Ocean and the Gulf of California and falls in widespread storms with longer duration and lower intensity. Precipitation generally comes as snow from October into April. Snowpack can persist for 3-4 months, although it may disappear in exposed areas during prolonged dry weather. Summer daytime temperatures are typically 80-90 but can exceed 95 degrees F. Winter temperatures of around 0 degrees F are common and can reach -25 degrees F.

Table 3. Representative climatic features

Frost-free period (average)	100 days
Freeze-free period (average)	130 days
Precipitation total (average)	635 mm

Influencing water features

The soil moisture on this ecological site comes from precipitation. The site does not benefit significantly from run-on moisture. Shallow bedrock areas will concentrate water in deeper soil pockets, where most of the vegetation production occurs. Because of the shallow soils, larger rainfall events will not be entirely captured by the site. This site contributes runoff to other ecological sites.

Soil features

The soils on this site are shallow to sandstone; They have formed in place from alluvium, residuum and eolian deposits derived from sandstone and shale. The surface textures of the mineral soil are sandy loam to fine sandy loam. Subsurface textures are loam, very fine sandy loam, sandy clay loam, and clay loam. An argillic horizon is usually present, although in some cases it has been lost.

Soil survey map unit components that have been correlated to this ecological site include:

SSA-713 Chinle Area MU 21 Flutedrock;

SSA-715 Fort Defiance Area AZ/NM MU 130 Verite.

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone and shale
Surface texture	(1) Fine sandy loam (2) Sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderate
Soil depth	25–51 cm
Surface fragment cover <=3"	1–15%
Surface fragment cover >3"	5–40%
Available water capacity (0-101.6cm)	5.08–6.35 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.6–7.3
Subsurface fragment volume <=3" (Depth not specified)	1–20%
Subsurface fragment volume >3" (Depth not specified)	5–40%

Ecological dynamics

An ecological site is not a precise assemblage of species for which the proportions are the same from place to place or from year to year. In all plant communities, variability is apparent in productivity and occurrence of individual species. Spatial boundaries of the communities; however, can be recognized by characteristic patterns of species composition, association, and community structure. The historic climax plant community for this ecological site has been described by sampling relict or relatively undisturbed sites and/or reviewing historic records. The historic climax plant community is the plant community that evolved over time with the soil forming process and long term changes in climatic conditions of the area. It is the plant community that was best adapted to the unique combination of environmental factors associated with the site.

Natural disturbances, such as drought, fire, grazing of native fauna, and insects, are inherent in the development and maintenance of these plant communities. The effects of these disturbances are part of the range of characteristics of the ecological site. Fluctuations in plant community structure and function caused by the effects of natural disturbances help establish the boundaries and characteristics of an ecological site. They are accounted for as part of the range of characteristics of the ecological site. Recognizable plant community phases are identified in the reference state of the ecological site. Some sites may have a small range of variation, while others have a large

range. Some plant community phases may exist for long periods of time, while others may only occur for a couple of years after a disturbance.

Deterioration of the plant community, hydrology, or soil site stability on an ecological site can result in crossing a threshold or potentially irreversible boundary to another state, or equilibrium. This can occur as a result of the loss of soil surface through erosion, the loss of the stability of the site due to disturbances that cause active erosion on the site, increases in the amounts and/or patterns or runoff from rainstorms, changes in availability of surface and subsurface water, significant changes in plant structural and functional types, or the introduction of non-native species. When these thresholds are crossed, the potential of the ecological site to return to the historic climax plant community can be lost, or restoration will require significant inputs. There may be multiple states possible for an ecological site, determined by the type and or severity of disturbance.

The known states and transition pathways for this ecological site are described in the state and transition model. Within each state, there may be one or more known plant community phases. These community phases describe the different plant community that can be recognized and mapped across this ecological site. The state and transition model is intended to help land users recognize the current plant community on the ecological site, and the management options for improving the plant community to the desired plant community.

Plant production information in this site description is standardized to the annual production on an air-dry weight basis in near normal rainfall years.

State and transition model

**35.8AZ Sandstone Upland 17-25" p.z.
(F035XH826AZ)**

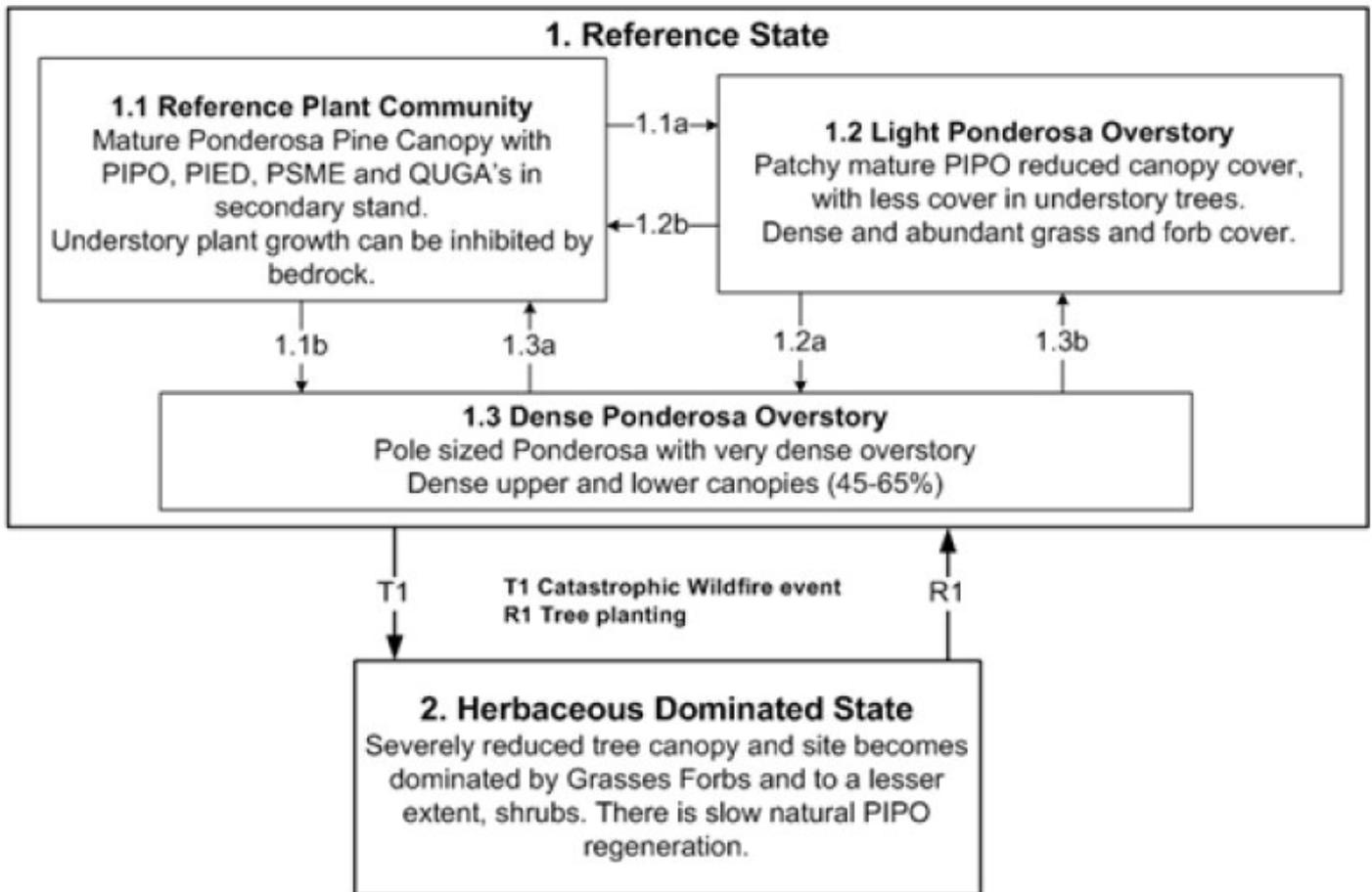


Figure 4. STM - F035XH826AZ

State 1
Reference State

Community 1.1
Reference Plant Community

This plant community is dominated by mature ponderosa pine - 20 to 35% canopy cover, with light scattered cover (1-15%) in shorter ponderosa pine, pinyon pine, Douglas fir and Gambel oak in understory. Shrubs are small, scattered and make up less than cover (2-5%). These includes Fendler ceanothus and creeping barberry. Grass and forb species range from 5 to 30% cover. Being lower in areas of dense tree canopy cover and/or bedrock. Grasses are dominated by mountain muhly, blue grama, with patches of pine dropseed, little bluestem, muttongrass and Arizona fescue. Forbs are secondary to grasses and are dominated by trailing fleabane, bahia, New Mexico groundsel.

Forest overstory. Overstory is dominated by mature Ponderosa Pine.

Forest understory. Understory is sparse, with some smaller trees (PIPO & QUGA) and very few shrubs. Grasses and forbs dominate the understory.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	404	448	538
Forb	67	112	135
Tree	28	56	112
Shrub/Vine	6	28	56
Total	505	644	841

Table 6. Soil surface cover

Tree basal cover	10-40%
Shrub/vine/liana basal cover	1-5%
Grass/grasslike basal cover	20-35%
Forb basal cover	5-10%
Non-vascular plants	0-1%
Biological crusts	0-1%
Litter	40-70%
Surface fragments >0.25" and <=3"	5-10%
Surface fragments >3"	5-10%
Bedrock	5-25%
Water	0%
Bare ground	0-5%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	0-1%	0-5%	5-30%	1-5%
>0.15 <= 0.3	0-1%	0-1%	0-10%	0-5%
>0.3 <= 0.6	0-1%	–	0-5%	0-1%
>0.6 <= 1.4	0-1%	–	–	–
>1.4 <= 4	0-1%	–	–	–
>4 <= 12	1-5%	–	–	–
>12 <= 24	10-30%	–	–	–
>24 <= 37	1-5%	–	–	–
>37	–	–	–	–

Figure 6. Plant community growth curve (percent production by month). AZ3581, 35.8 17-25" p.z. all sites. Growth begins in the spring, most growth occurs during the summer rainy season..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	4	10	24	21	23	13	5	0	0

Figure 7. Plant community growth curve (percent production by month). AZ3901, 35.8 17-25" p.z. muttongrass. Growth begins in the spring and extends through the summer rainy season..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	10	30	20	20	10	5	0	0

Figure 8. Plant community growth curve (percent production by month). AZ3902, 35.8 17-25" p.z. Arizona fescue. Growth begins in the late spring and extends through the summer rainy season..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	0	5	20	30	30	10	5	0	0

Figure 9. Plant community growth curve (percent production by month). AZ3903, 35.8 17-25" p.z. western wheatgrass. Growth begins in the spring, most growth occurs in the summer. Seed set occurs in the fall..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	10	15	25	30	10	5	0	0

Community 1.2 Light Ponderosa Pine Overstory

This community has a light overstory of mature ponderosa pine with a scattered secondary overstory of other trees. The understory has a high cover of grasses and forbs and scattered shrubs. There may be pockets of Gambel's oak.

Community 1.3 Dense Ponderosa Overstory

This community has a dense overstory of ponderosa pine. The main and secondary overstory canopy are dominated by ponderosa pine with a scattered canopy of mature Gambel oaks. The understory is light with only scattered with short and midgrasses, forbs with patches of shrubs.

Pathway 1.1a Community 1.1 to 1.2

Partial removal of mature PIPO canopy through timber harvest, or Bark beetle infestation. This results in higher production on the forest floor of grass, forb and to some extent shrubs.

Pathway 1.1b **Community 1.1 to 1.3**

Openings are filled in by natural regeneration of Ponderosa pine, forming an even aged tight canopy of sapling to pole size PIPO

Pathway 1.2b **Community 1.2 to 1.1**

Trees thinned through droughts coupled with patchy fire or beetle kills or natural mortality forming a patchy and mature canopy. Selective timber harvesting/woodcutting can also thin the overstory.

Pathway 1.2a **Community 1.2 to 1.3**

Openings are filled in by natural regeneration of Ponderosa pine, forming an even aged tight canopy of sapling to pole size PIPO

Pathway 1.3a **Community 1.3 to 1.1**

Trees mature and are thinned either naturally or through Pre-commercial thinning forming a mature canopy.

Pathway 1.3b **Community 1.3 to 1.2**

Trees mature and are thinned more heavily than 1.3a pathway, through fire or timber harvest forming a patchy and mature canopy.

State 2 **Herbaceous Vegetation Dominated State**

Community 2.1 **Severely Reduced Canopy - Grass and Forb Dominated**

Hot fire, logging or Beetle Kill severely reduced tree canopy and site becomes dominated by Grasses Forbs and shrubs. There is not adequate regeneration of Ponderosa Pine on this site. The return pathway would return the plant community to a site similar to plant community 1.2, a low even-aged overstory dominated by pole-size ponderosa and other young trees

Transition T1 **State 1 to 2**

This transition occurs with a significant event that severely reduces the tree canopy. This can occur through a prolonged drought and coupled with widespread beetle kill and/or catastrophic wildfire.

Restoration pathway R1 **State 2 to 1**

This return pathway can be achieved through tree plantings to accelerate tree regeneration.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Common Grasses			404–538	
	mountain muhly	MUMO	<i>Muhlenbergia montana</i>	112–224	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	56–112	–
	Arizona fescue	FEAR2	<i>Festuca arizonica</i>	11–67	–
	muttongrass	POFE	<i>Poa fendleriana</i>	11–67	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	6–56	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	11–45	–
	pine dropseed	BLTR	<i>Blepharoneuron tricholepis</i>	6–28	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–28	–
	Grass, annual	2GA	<i>Grass, annual</i>	0–22	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–22	–
	sedge	CAREX	<i>Carex</i>	0–17	–
Forb					
2	Common Forbs			67–135	
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–34	–
	Forb, annual	2FA	<i>Forb, annual</i>	0–28	–
	trailing fleabane	ERFL	<i>Erigeron flagellaris</i>	11–22	–
	yellow hawkweed	HIFE	<i>Hieracium fendleri</i>	0–11	–
	Wright's deervetch	LOWR	<i>Lotus wrightii</i>	0–11	–
	New Mexico groundsel	PANE7	<i>Packera neomexicana</i>	0–11	–
	nodding onion	ALCE2	<i>Allium cernuum</i>	0–11	–
	Carruth's sagewort	ARCA14	<i>Artemisia carruthii</i>	0–11	–
	tarragon	ARDR4	<i>Artemisia dracuncululus</i>	0–11	–
	spreading fleabane	ERDI4	<i>Erigeron divergens</i>	0–11	–
Shrub/Vine					
3	Common Shrubs			6–56	
	Subshrub (<.5m)	2SUBS	<i>Subshrub (<.5m)</i>	0–22	–
	Fendler's ceanothus	CEFE	<i>Ceanothus fendleri</i>	0–17	–
	creeping barberry	MARE11	<i>Mahonia repens</i>	0–17	–
	Stansbury cliffrose	PUST	<i>Purshia stansburiana</i>	0–11	–
	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	0–11	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0–11	–
	whitemargin pussytoes	ANMA5	<i>Antennaria marginata</i>	0–6	–
	small-leaf pussytoes	ANPA4	<i>Antennaria parvifolia</i>	0–6	–
Tree					
4	Tree Saplings/Young Trees			28–112	
	ponderosa pine	PIPO	<i>Pinus ponderosa</i>	56–112	–
	Gambel oak	QUGA	<i>Quercus gambelii</i>	6–56	–
	Douglas-fir	PSME	<i>Pseudotsuga menziesii</i>	0–22	–
	twoneedle pinyon	PIED	<i>Pinus edulis</i>	0–22	–
	Utah juniper	JIJS	<i>Juniperus osteosperma</i>	0–11	–

	Utah juniper	JUSC	<i>Juniperus osteosperma</i>	0-11	-
	Rocky Mountain juniper	JUSC2	<i>Juniperus scopulorum</i>	0-11	-

Animal community

Site is favorable for grazing throughout most of the year except when snow cover restricts availability of forage. Planned grazing systems adapt well to use on this site.

The potential plant community produced by this site provides food for those species of wildlife that utilize grass as a major portion of their diet.

Recreational uses

This site has a variety of spring and summer flowers which are particularly noticeable after good moisture periods. It has good aesthetic appeal when not severely disturbed.

Winters are cold, however, relatively mild spring, fall and summer months are attractive to recreationists.

Recreational activities most likely to occur are hunting, cross-country riding, photography and wildlife observation.

Wood products

All kinds of equipment are suitable for harvesting, site preparation, tree planting and pre-commercial thinning. Slopes are non-restrictive. Un-surfaced roads limit equipment when wet. Water erosion is slight to moderate in bare areas; wind erosion is moderate to high.

Compaction potential is good, but soils will rut when wet. Re-vegetation potential is good.

Harvest fully grown trees on a sustained yield basis. Final removal cuts and intermediate cuts are desirable. Thick stands need thinned to improve growth rates of trees left. Periodic ground fires will reduce dense understory vegetation competing for moisture. Slopes are gentle and soils are deep, so mechanical tree removal is not limited. Control unwanted pests to limit tree damage and loss. Fire hazard becomes extreme as understory fuel load builds. Site is good for replanting. There is slight limitation to seedling mortality; expected mortality rate is less than 25%. Natural regeneration is slightly limited; low end of productive pine sites. Seedlings need protection from grazing. Plant competition is moderately limited due to dense grass cover and grazing that may impede regeneration. Wind throw hazard: slight limitation, rooting depth greater than 30".

Other references

Updates and revisions for this ESD were conducted as part of a 2007-2012 Interagency Technical Assistance Agreement between the Bureau of Indian Affairs–Navajo Region and the NRCS-Arizona

Contributors

Dan Carroll
Dean Schlichting

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	
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):**

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:

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

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

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

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:**
-

17. **Perennial plant reproductive capability:**
-