

# Ecological site R035XB233AZ Limestone/Sandstone Upland 6-10" p.z. Saline

Accessed: 06/10/2026

## 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): 035X–Colorado Plateau

This ecological site occurs in Common Resource Area 35.2 - the Colorado Plateau Shrub – Grasslands Elevations range from 3800-5800 feet and precipitation averages 6 to 10 inches per year. Vegetation includes shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, galleta, blue grama, and black grama. The soil temperature regime is mesic and the soil moisture regime is typic aridic. 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

R035XB232AZ	Limestone/Sandstone Upland 6-10" p.z.
R035XB240AZ	Limestone/Sandstone Cliffs 6-10" p.z.
R035XB251AZ	Mudstone/Sandstone Hills 6-10" p.z. Warm

## Similar sites

R035XB232AZ	<p style="text-align: center;">Limestone/Sandstone Upland 6-10" p.z.</p> <p>The soils of this site are very similar, but are slightly less alkaline.</p>
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**Table 1. Dominant plant species**

Tree	Not specified
Shrub	(1) <i>Atriplex confertifolia</i>
Herbaceous	(1) <i>Sporobolus cryptandrus</i> (2) <i>Pleuraphis jamesii</i>

## Physiographic features

This site is found on limestone and calcareous sandstone on benches and slopes of plateaus. The site does not significantly benefit from run-on moisture. The soils are shallow (<20") to bedrock. The soil surface textures range from gravelly sandy loam to loams and are highly calcareous. It usually has an undulating appearance. Slopes generally range from 0 to 15 percent, but there can be steeper spots within the site.

Table 2. Representative physiographic features

Landforms	(1) Plateau
Flooding frequency	None
Ponding frequency	None
Elevation	1,160 – 1,770 m
Slope	0 – 20 %
Aspect	Aspect is not a significant factor

## Climatic features

The 35.2 Colorado Plateau Cold Desert Shrub - Grassland common resource area has a very dry and windy climate that is hot in the summer and cold in the winter. The annual precipitation averages between 6 and 10 inches. The soil moisture regime is typical aridic and the soil temperature regime is mesic. A slight majority of the precipitation arrives during the late fall, winter, and early spring. This winter season moisture originates in the Pacific Ocean and arrives as rain, or sometimes snow, during widespread frontal storms of generally low intensity. The majority of the snow (average range of 1 to 17 inches) falls from December through February, but rarely lasts more than a few days. A seasonal drought occurs from late May through early July. Summer rains occur from July through September during brief intense local thunderstorms. The rain is sporadic in intensity and location. The moisture originates from the Gulf of Mexico in the early summer and the Gulf of California in the late summer/early fall. Windy conditions are common year round, but the winds are strongest and most frequent during the spring.

Table 3 Representative climatic features

Frost-free period (average)	180 days
Freeze-free period (average)	210 days
Precipitation total (average)	250 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

Soils associated with this site have developed in mixed alluvium from parent material of Kaibab formation limestone and sandstone, and Moenkopi formation sandstone, shale and gypsum. The soils are very alkaline (PH > 8.8), slightly saline (EC = 5.2), slightly sodic, and are strongly effervescent at or near the surface. Surface textures range from gravelly sandy loam to loams. They are generally very shallow to shallow, but there can be small areas with deeper soils.

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

SSA-707 Little Colorado River area 5-Cataract, 11-Cataract/Shinume;

SSA-713 Chinle area 34-Somorent Family.

**Table 4. Representative soil features**

Parent material	(1) Alluvium – limestone, sandstone, and shale
Surface texture	(1) Gravelly sandy loam (2) Loam
Family particle size	(1) Loamy
Drainage class	Well drained to excessively drained
Permeability class	Moderate to moderately rapid
Soil depth	30 – 50 cm
Surface fragment cover <=3"	20 – 50 %
Surface fragment cover >3"	0 – 10 %
Available water capacity (0-101.6cm)	4.14 – 5.59 cm
Calcium carbonate equivalent (0-101.6cm)	10 – 30 %
Electrical conductivity (0-101.6cm)	10 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	10

Soil reaction (1:1 water) (0-101.6cm)	8.5 – 10
Subsurface fragment volume <=3" (Depth not specified)	40 – 60 %
Subsurface fragment volume >3" (Depth not specified)	0 – 10 %

### 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

Figure 3. 352 LimestoneSandstone UplandSaline S&T

### Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Grass/Grasslike</b>			193-318	
2	<b>Dropseeds</b>			101-168	

	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	101-140	-
	gyp dropseed	SPNE	<i>Sporobolus nealleyi</i>	0-4	-
	spike dropseed	SPCO4	<i>Sporobolus contractus</i>	0-4	-
3	<b>Galleta</b>			39-59	
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	39-59	-
4	<b>Black Grama</b>			12-20	
	black grama	BOER4	<i>Bouteloua eriopoda</i>	12-20	-
5	<b>Cool Season Grasses</b>			20-48	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	20-39	-
	Fendler threeawn	ARPUL	<i>Aristida purpurea var. longiseta</i>	0-4	-
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0-4	-
6	<b>Burrograss</b>			16-28	
	burrograss	SCBR2	<i>Scleropogon brevifolius</i>	16-28	-
7	<b>Miscellaneous Perennial Grasses</b>			4-16	
	nineawn pappusgrass	ENDE	<i>Enneapogon desvauxii</i>	4-9	-
	bush muhly	MUPO2	<i>Muhlenbergia porteri</i>	0-4	-
	low woollygrass	DAPU7	<i>Dasyochloa pulchella</i>	0-4	-
	hairy woollygrass	ERPI5	<i>Erioneuron pilosum</i>	0-1	-
	desert needlegrass	ACSP12	<i>Achnatherum speciosum</i>	0-1	-
8	<b>Annual Grasses</b>			0-8	
	needle grama	BOAR	<i>Bouteloua aristidoides</i>	0-4	-
	sixweeks grama	BOBA2	<i>Bouteloua barbata</i>	0-4	-
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	0-4	-
<b>Forb</b>					
9	<b>Forb</b>			4-20	
	globemallow	SPHAE	<i>Sphaeralcea</i>	4-9	-
	Forb, annual	2FA	<i>Forb, annual</i>	0-4	-
	Forb, perennial	2FP	<i>Forb, perennial</i>	0-4	-
	windmills	ALLIO	<i>Allionia</i>	0-4	-
	flatcrown buckwheat	ERDE6	<i>Eriogonum deflexum</i>	0-4	-
	desert trumpet	ERIN4	<i>Eriogonum inflatum</i>	0-4	-
	pepperweed	LEPID	<i>Lepidium</i>	0-4	-
	phacelia	PHACE	<i>Phacelia</i>	0-4	-
	mountain phlox	PHAU3	<i>Phlox austromontana</i>	0-4	-
	plantain	PLANT	<i>Plantago</i>	0-1	-
	Colorado four o'clock	MIMU	<i>Mirabilis multiflora</i>	0-1	-
	evening primrose	OENOT	<i>Oenothera</i>	0-1	-
	wallflower	ERYSI	<i>Erysimum</i>	0-1	-
<b>Shrub/Vine</b>					
10	<b>Shrubs/Cactus/Yuccas</b>			133-259	
11	<b>Shadscale Saltbush</b>			99-177	
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	99-177	-
12	<b>Ephedras</b>			11-20	
	Torrey's jointfir	EPTO	<i>Ephedra torreyana</i>	11-20	-
	Cutler's jointfir	EPCU	<i>Ephedra cutleri</i>	0-4	-
13	<b>Saltbush and Winterfat</b>			0-12	

	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	0-12	-
	Garrett's saltbush	ATGA2	<i>Atriplex garrettii</i>	0-4	-
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	0-4	-
14	<b>Cactus and Yuccas</b>			20-39	
	grizzlybear pricklypear	OPPOH	<i>Opuntia polyacantha var. hystricina</i>	20-39	-
	narrowleaf yucca	YUAN2	<i>Yucca angustissima</i>	0-4	-
	Engelmann's hedgehog cactus	ECENV	<i>Echinocereus engelmannii var. variegatus</i>	0-4	-
	barrel cactus	FEROC	<i>Ferocactus</i>	0-1	-
15	<b>Miscellaneous Shrubs</b>			4-11	
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	1-11	-
	water jacket	LYAN	<i>Lycium andersonii</i>	0-4	-
	blackbrush	CORA	<i>Coleogyne ramosissima</i>	0-1	-
	rubber rabbitbrush	ERNAG	<i>Ericameria nauseosa ssp. nauseosa var. glabrata</i>	0-1	-

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 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Grass/Grasslike</b>			193-318	
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	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	101-140	-
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	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	39-59	-
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	black grama	BOER4	<i>Bouteloua eriopoda</i>	12-20	-
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	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	20-39	-
	Fendler threeawn	ARPUL	<i>Aristida purpurea var. longiseta</i>	0-4	-
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0-4	-
6	<b>Burrograss</b>			16-28	
	burrograss	SCBR2	<i>Scleropogon brevifolius</i>	16-28	-
7	<b>Miscellaneous Perennial Grasses</b>			4-16	
	nineawn pappusgrass	ENDE	<i>Enneapogon desvauxii</i>	4-9	-
	low woollygrass	DAPU7	<i>Dasyochloa pulchella</i>	0-4	-
	bush muhly	MUPO2	<i>Muhlenbergia porteri</i>	0-4	-
	desert needlegrass	ACSP12	<i>Achnatherum speciosum</i>	0-1	-
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8	<b>Annual Grasses</b>			0-8	
	needle grama	BOAR	<i>Bouteloua aristidoides</i>	0-4	-
	sixweeks grama	BOBA2	<i>Bouteloua barbata</i>	0-4	-
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0-4	-
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	0-4	-
	red brome	BRRU2	<i>Bromus rubens</i>	0-1	-

Forb					
9	<b>Annual and Perennial Forbs</b>			4-20	
	globemallow	SPHAE	<i>Sphaeralcea</i>	4-9	-
	Russian thistle	SAKA	<i>Salsola kali</i>	0-4	-
	Forb, annual	2FA	<i>Forb, annual</i>	0-4	-
	Forb, perennial	2FP	<i>Forb, perennial</i>	0-4	-
	windmills	ALLIO	<i>Allionia</i>	0-4	-
	flatcrown buckwheat	ERDE6	<i>Eriogonum deflexum</i>	0-4	-
	desert trumpet	ERIN4	<i>Eriogonum inflatum</i>	0-4	-
	pepperweed	LEPID	<i>Lepidium</i>	0-4	-
	phacelia	PHACE	<i>Phacelia</i>	0-4	-
	mountain phlox	PHAU3	<i>Phlox austromontana</i>	0-4	-
	plantain	PLANT	<i>Plantago</i>	0-1	-
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	evening primrose	OENOT	<i>Oenothera</i>	0-1	-
	wallflower	ERYSI	<i>Erysimum</i>	0-1	-
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	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	99-177	-
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	Engelmann's hedgehog cactus	ECENV	<i>Echinocereus engelmannii var. variegatus</i>	0-4	-
	barrel cactus	FEROC	<i>Ferocactus</i>	0-1	-
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	water jacket	LYAN	<i>Lycium andersonii</i>	0-4	-
	blackbrush	CORA	<i>Coleogyne ramosissima</i>	0-1	-
	rubber rabbitbrush	ERNAG	<i>Ericameria nauseosa ssp. nauseosa var. glabrata</i>	0-1	-

Table 8. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 2.3 plant community composition

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

This site is suitable for grazing during any period of the year by cows and calves, stocker cattle, sheep and horses. The potential plant community provides a variety of food and cover plants for wildlife.

## Recreational uses

This site is typified by shrubby grasslands on undulating benches and slopes of plateaus. Winters are cold, however, moderate spring, fall and summer temperatures are attractive to recreational users. The site lends itself to activities such as hunting, horseback riding, photography, hiking, rock collecting, and wildlife observation.

## Wood products

No wood products are produced from this site.

## Type locality

Location 1: Coconino County, AZ	
Township/Range/Section	T39N R6E S26
General legal description	Marble Canyon area; section 26, T39N, R6E; Bitter Springs Quad; about 2 miles east of Cliff Dwellers, AZ.

## 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

Ken Gishi  
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## 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)	Steve Cassady
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Date	11/19/2010
Approved by	
Approval date	

Composition (Indicators 10 and 12) based on	Annual Production
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## Indicators

1. **Number and extent of rills:** Generally none. A few short rills may occur on steeper slopes.

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2. **Presence of water flow patterns:** Generally none. A few short water flow patterns may occur on steeper slopes.

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3. **Number and height of erosional pedestals or terracettes:** Generally none. Occasional, short pedestals may occur on steeper slopes.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**  
Bare ground ranges from 9 to 11 percent.

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

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

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7. **Amount of litter movement (describe size and distance expected to travel):** Generally litter stays in place. Evidence of litter movement is expected following the occasional intense summer thunderstorms known in the area of this ecological site. Expect some movement on steeper slopes.

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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):** The soil surface is fairly well armored by gravels. Expect soil surface stability test ratings of: Overall average - 3.8 to 4.4, under canopy - 5.5 to 6, without canopy - 3.5 to 4.5.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** SOM is naturally very low in soils associated with this ecological site. A-horizons may be very hard to distinguish even in reference state. Evidence of SOM loss is noticeable sheet erosion, rills, water flow patterns, wind scouring, litter movement and/or reduced soil surface stability scores.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Expect shrubs to be randomly, but uniformly scattered across the ecological site. Herbaceous vegetation is generally uniformly scattered within the interspaces, but may be in patches, especially galleta and black grama. Expect larger patches without herbaceous vegetation in areas where bedrock is at or very near the surface. The average fetch (the distance from a sample point, such as line point, to the nearest perennial plant) is 6 to 9 inches. Extremes of 0 (basal occurrences) to as high as 25 inches (areas with

bedrock at or near the surface) should be expected. Typically the range will be 3 to 12 inches.

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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):** None.
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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:** Short shrubs (Shadscale saltbush)

**Sub-dominant:** Perennial grasses

**Other:**

**Additional:** Short shrubs>> warm season bunch grasses> warm season sod-grasses> cool season grasses> cactus> forbs> annual grasses.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**  
No more than ten percent of long-lived perennial plants should show signs of mortality. Short-lived perennials can be expected to experience higher mortality due to year-to-year fluctuations in precipitation amount and timing.
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14. **Average percent litter cover (%) and depth ( in):** In ungrazed areas the majority of litter seen in interspaces is from annual forbs and grasses. Even this tends to remain standing for several months after the plant has senesced. Leaf litter from shrubs tends to stay within a few inches of the dripline of the shrub. Litter from perennial grasses and forbs often remains standing for several years.
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**  
Expect the annual total plant community production to be about 350 pounds per acre of air-dried material. Optimum climatic conditions with above average precipitation can commonly result in 550 pounds per acre of air-dried material. Adverse climatic conditions with below average precipitation can be expected to produce about 200 pounds per acre of air-dried material.
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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: Cheatgrass, red brome, and Russian thistle are all expected to be found on the site in very minor amounts (Trace to a few pounds per acre of air-dried material).**
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17. **Perennial plant reproductive capability:** The only natural limitations to reproductive capability are weather related and natural disease or herbivory that reduces reproductive capability.
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