# Ecological site R035XY217UT
# Semidesert Sandy Loam (Spiny Hopsage)

Last updated: 5/19/2025
Accessed: 06/21/2026

## 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

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## Ecological site concept

This site occurs on mesas and plains on structural benches. The soils are moderately deep to very deep and well drained. The dominant aspect of the vegetative community is spiny hopsage with a few other shrubs, mostly Cutler mormontea and blackbrush. The herbaceous understory includes galleta, needle and thread, sand dropseed, and Indian ricegrass. Soils are derived from eolian sand depositions and sandstone and siltstone alluvium and residuum. Surface texture is generally a loamy fine sand or very fine sandy loam. These soils are well developed and may have a cambic or argillic horizon. Soils usually will also have a calcic horizon or an accumulation of calcium carbonate. Soil temperature and moisture regimes are mesic and ustic aridic respectively.

## Associated sites

| | |
|---|---|
| **R035XY218UT** | **Semidesert Sandy Loam (Blackbrush)** |
| **R035XY221UT** | **Semidesert Shallow Loam (Utah Juniper-Pinyon)** |
| **R035XY233UT** | **Semidesert Shallow Sandy Loam (Blackbrush)** |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | Not specified |
| Shrub | (1) *Grayia spinosa*<br>(2) *Gutierrezia sarothrae* |
| Herbaceous | (1) *Achnatherum hymenoides*<br>(2) *Pleuraphis jamesii* |

## Physiographic features

Plains on structural benches and mesas.

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Plain<br>(2) Structural bench |
| Elevation | 1,490 – 1,770 m |
| Slope | 0 – 20 % |

## Climatic features

Approximately 70-75% occurs as rain from March through October. On the average, February, May, and June are the driest months and July through October are the wettest months. Precipitation is extremely variable from month to month and from year to year. Much of the summer precipitation occurs as convection thunderstorms.

**Table 3 Representative climatic features**

| | |
|---|---|
| Frost-free period (average) | 160 days |
| Freeze-free period (average) | 140 days |
| Precipitation total (average) | 310 mm |

## Influencing water features

There are no water features directly influencing this site. Ephemeral drainageways sometimes pass through this site.

## Soil features

The soils are moderately deep to very deep and well drained. Soils are derived from eolian sand depositions and sandstone and siltstone alluvium and residuum. Soil temperature and moisture regimes are mesic and ustic aridic respectively. Typically the dry surface is reddish brown, brown, yellowish brown, or red. Surface texture is generally a loamy fine sand or very fine sandy loam. These soils are well developed and may have a cambic or argilic horizon. Soils usually will also have a calcic horizon or an accumulation of calcium carbonate. Runoff potential is very slow to moderate and permeability is moderate to moderately rapid. Soils on reference state sites typically have moderate wind and water erosion potential, and the occurrence of water flow patterns, rills, gullies, and coppice mounding of shrubs is uncommon; however they can be found. Biological crust cover is characterized by a weak crust, with light cyanobacteria and/or isolated moss clumps, with no continuity or isolated pinnacles of lichen and moss with little continuity. In disturbed areas, rodent activity, water flow patterns, and coppice mounding of shrubs are more common than on sites in the reference state. This site has been used in the following soils surveys and has been correlated to the following components:

UT643-San Juan County, Utah, Navajo Indian Reservation-Milok
UT686—Escalante Grand Staircase National Monument--Sanostee

Typical soil profile: Sanostee, warm
A1 : 0 to 4 inches: fine sandy loam
A2 : 4 to 9 inches: fine sandy loam
Bt : 9 to 18 inches: sandy clay loam
Btk1 : 18 to 26 inches: sandy clay loam
Btk2 : 26 to 30 inches: sandy clay loam

Ck : 30 to 35 inches: sandy clay loam
R : 35 to 45 inches: bedrock

**Table 4. Representative soil features**

| | |
|---|---|
| Parent material | (1) Eolian sands – sandstone<br>(2) Residuum – glauconitic sandstone |
| Surface texture | (1) Fine sandy loam<br>(2) Loamy fine sand<br>(3) Sandy clay loam |
| Family particle size | (1) Fine-loamy<br>(2) Coarse-loamy |
| Drainage class | Well drained to excessively drained |
| Permeability class | Moderately slow to moderately rapid |
| Soil depth | 50 – 100 cm |
| Surface fragment cover <=3" | 0 – 10 % |
| Available water capacity (0-101.6cm) | 14.73 – 17.27 cm |
| Calcium carbonate equivalent (0-101.6cm) | 20 – 30 % |
| Electrical conductivity (0-101.6cm) | 0 – 10 mmhos/cm |
| Sodium adsorption ratio (0-101.6cm) | 10 |

## Ecological dynamics

As ecological condition deteriorates due to overgrazing, Indian ricegrass, and needleandthread decrease while galleta, spiny hopsage, and Cutler mormontea increase. When the potential natural plant community is burned, spiny hopsage,blackbrush and fourwing saltbush decreases while Cutler mormontea, broom snakeweed, Indian ricegrass and galleta increase. Cheatgrass, Russian thistle, and Utah juniper are most likely to invade this site. As the calcic layer in the soil goes deeper, the spiny hopsage decreases and grasses increase.

Suitability for rangeland seeding is poor to fair. The major limiting factor is precipitation that can be variable with low years. Disturbed areas can be seeded to control erosion. Plants suitable for seeding include Indian ricegrass, crested wheatgrass, and other adapted native plants.

Brush Management and seeding can be used to improve the vegetation in deteriorated
areas of the range that are producing more woody shrubs than would be present in the potential natural plant community. Suitable brush management practices include prescribed burning, chemical spraying, and mechanical treatment.

## 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 (%) |
|---|---|---|---|---|---|
| **Shrub/Vine** | | | | | |
| 0 | **Dominant Shrubs** | | | 300-465 | |
| | spiny hopsage | GRSP | *Grayia spinosa* | 228-308 | – |
| | blackbrush | CORA | *Coleogyne ramosissima* | 26-56 | – |
| | Cutler's jointfir | EPCU | *Ephedra cutleri* | 26-56 | – |
| | fourwing saltbush | ATCA2 | *Atriplex canescens* | 16-28 | – |
| | broom snakeweed | GUSA2 | *Gutierrezia sarothrae* | 6-17 | – |
| 3 | **Sub-Dominant Shrubs** | | | 38-95 | |
| | Shrub (>.5m) | 2SHRUB | *Shrub (>.5m)* | 16-28 | – |
| | Torrey's jointfir | EPTO | *Ephedra torreyana* | 6-17 | – |
| | winterfat | KRLA2 | *Krascheninnikovia lanata* | 6-17 | – |
| | plains pricklypear | OPPO | *Opuntia polyacantha* | 6-17 | – |
| | narrowleaf yucca | YUAN2 | *Yucca angustissima* | 6-17 | – |
| **Grass/Grasslike** | | | | | |
| 0 | **Dominant Grasses** | | | 99-196 | |
| | Indian ricegrass | ACHY | *Achnatherum hymenoides* | 26-56 | – |
| | James' galleta | PLJA | *Pleuraphis jamesii* | 26-56 | – |
| | sand dropseed | SPCR | *Sporobolus cryptandrus* | 16-28 | – |
| | blue grama | BOGR2 | *Bouteloua gracilis* | 16-28 | – |
| | needle and thread | HECO26 | *Hesperostipa comata* | 16-28 | – |
| 1 | **Sub-Dominant Grasses** | | | 43-90 | |
| | Grass, annual | 2GA | *Grass, annual* | 16-28 | – |
| | Grass, perennial | 2GP | *Grass, perennial* | 16-28 | – |
| | purple threeawn | ARPU9 | *Aristida purpurea* | 6-17 | – |
| | sixweeks fescue | VUOC | *Vulpia octoflora* | 6-17 | – |
| **Forb** | | | | | |
| 2 | **Sub-Dominant Forbs** | | | 75-168 | |
| | Forb, annual | 2FA | *Forb, annual* | 16-28 | – |
| | Forb, perennial | 2FP | *Forb, perennial* | 16-28 | – |
| | Douglas' dustymaiden | CHDO | *Chaenactis douglasii* | 16-28 | – |
| | twolobe larkspur | DENU2 | *Delphinium nuttallianum* | 6-17 | – |
| | woolly plantain | PLPA2 | *Plantago patagonica* | 6-17 | – |
| | gooseberryleaf globemallow | SPGR2 | *Sphaeralcea grossulariifolia* | 6-17 | – |
| | milkvetch | ASTRA | *Astragalus* | 6-17 | – |
| | sego lily | CANU3 | *Calochortus nuttallii* | 6-17 | – |

**Table 6. Community 1.2 plant community composition**

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

## Animal community

--Livestock and Wildlife Grazing-- This site provides good grazing conditions for livestock and wildlife during fall, winter, and spring accessibility and abundance of available nutritious forage. This site, however, may lack natural perennial water sources, which can influence the suitability for livestock and wildlife grazing. Care should be taken to maintain the native perennial grass and shrub communities due to the poor suitability for re-seeding or restoring this site. Reseeding and/or restoration are difficult due to the extreme temperatures and variability in time and amount of precipitation. This site may occur in desert bighorn sheep and pronghorn antelope habitat; however in many places the populations will be small and have little grazing impact on the site. The plant composition by annual air-dry weight is generally and equal mixture of grasses and shrubs, however plant canopy cover is primarily shrubs with majority cover from spiny hopsage. This shrub provides fair browse for domestic goats and sheep and pronghorn antelope in late fall, winter and spring; however overall value is limited because the majority and leaves and fruits and shed by mid summer. Thorns can also deter browsing use. Sub-dominant shrubs include Cutler jointfir, blackbrush, and fourwing saltbush, which provide browse for wildlife and livestock in the spring, fall, and especially winter, when they may be critical forage species. Grasses include Indian ricegrass, galleta, needleandthread, sand dropseed, and blue grama, which provide good grazing conditions for all classes of livestock and wildlife. Forb composition and annual production depends primarily on precipitation amounts and thus is challenging to use in livestock grazing management decisions. Forb composition should be monitored for species diversity, as well as poisonous or injurious plant communities which may be detrimental to livestock if grazed. Before making specific grazing management recommendations, an onsite evaluation must be made. --References-- Relative Forage Preference of Plants for Grazing Use by Season: Plants commonly found in Major Land Resource Area D35 --The Colorado Plateau. 2007 Stubbendieck, J., S. L. Hatch, and C. H. Butterfield. 1997. North American range plants. Lincoln, NE: University of Nebraska Press. 501p. USDA, Forest Service. 2007. Fire effects information: plant species life form. Available at http://www.fs.fed.us/database/feis/plants/index.html. Accessed 7 August 2007.

## Hydrological functions

The hydrologic group is C.

## Recreational uses

Recreational uses are hiking, hunting, horseback riding, ATV and motorcycle riding.

## Wood products

None

## Other information

--Poisonous\Toxic Plant Communities-- Toxic plants associated with this site include broom snakeweed and two lobe larkspur. Broom snakeweed contains steroids, terpenoids, saponins, and flavones that can cause abortions or reproductive failure in sheep and cattle, however cattle are most susceptible. These toxins are most abundant during active growth and leafing stage. Cattle and sheep will typically only graze broom snakeweed when other forage is unavailable and generally in winter when toxicity levels are at their lowest. Two lobe larkspur affects cattle only—sheep and goats have been used a biological control mechanism to reduce larkspur communities. This plant contains many diterpenoid alkaloids which can cause sudden death, uneasiness, increased excitability, muscle weakness, staggering, and stiffness. Larkspur toxicity levels are highest during the vegetative state when the plants are less palatable, and as the plants mature, toxicity decreases, but palatability increases. This creates a toxic window during the flowering stage in which cattle are most susceptible to poisoning. During this time plants are palatable and toxic enough to have a detrimental effect. Potentially toxic plants associated with this site include fourwing saltbush, which may accumulate selenium, but only when growing on selenium enriched soils. These plants, when consumed will cause alkali disease or chronic selenosis, which affects all classes of livestock (excluding goats). Typically animals consuming 5-50 ppm selenium will develop chronic selenosis and animals consuming greater than 50 ppm selenium will develop acute selenosis. Clinical signs include lameness, soughing of the hoof, hair loss, blindness, and aimless wondering. Horses tend to develop what is called a “bob” tail or “roached” main due to breakage of the long hairs. Russian thistle is an invasive toxic plant, causing nitrate and to a lesser extent oxalate poisoning, which affects all classes of livestock. The buildup of nitrates in these plants is highly dependent upon environmental factors, such as after a rain storm during a drought, cool/cloudy days, and soils high in nitrogen and low in sulfur and phosphorus, all which cause increased nitrate accumulation. Nitrate collects in the stems and can persist throughout the growing season. Clinical signs of nitrate poisoning include drowsiness, weakness, muscular tremors, increased heart and respiratory rates, staggering gait, and death. Conversely, oxalate poisoning causes kidney failure; clinical signs include muscle tremors, tetany, weakness, and depression. Poisoning generally occurs when livestock consume and are not accustomed to grazing oxalate-containing plants. Animals with prior exposure to oxalates have increased numbers of oxalate-degrading rumen microflora and thus are able to degrade the toxin before clinical poisoning can occur. --Invasive Plant Communities-- Generally as ecological conditions deteriorate and perennial vegetation decreases due to disturbance (fire, over grazing, drought, off road vehicle overuse, erosion, etc.) annual forbs and grasses will invade the site. Of particular concern in semi-arid environments are the non-native annual invaders including cheatgrass,

Russian thistle, kochia, halogeton, and annual mustards. The presence of these species will depend on soil properties and moisture availability; however, these invaders are highly adaptive and can flourish in many locations. Once established, complete removal is difficult but suppression may be possible. Pinyon and Utah juniper are natural invaders if stands are found adjacent to this site. Trees left uncontrolled can form dense stands and eventually dominate the site. Spiny hopsage sites are generally alkaline and saline and thus invaders into this site will be tolerant of these conditions. --Fire Ecology-- The ability for an ecological site to carry fire depends primarily on the present fuel load and plant moisture content—sites with small fuel loads will burn more slowly and less intensely than sites with large fuel loads. Many semi-desert plant communities in the Colorado Plateau may have evolved without the influence of fire. However a year of exceptionally heavy winter rains can generate fuels by producing heavy stands of annual forbs and grasses. When fires do occur, the effect on the plant community may be extreme due to the harsh environment and slow rate of recovery. Spiny hopsage ecological sites appear to be somewhat fire tolerant and often survive fires that kill adjacent sagebrush sites. Fire intervals seem to be influenced by sites adjacent to spiny hopsage sites. When fire does occur, generally in late summer when plants are dormant, this plant is generally top-killed and generally will sprout the following spring. --References-- Knight, A. P. and R. G. Walter. 2001. A guide to plant poisoning of animals in North America. Jackson, WY: Teton NewMedia. 367p. USDA, Forest Service. 2007. Fire effects information: plant species life form. Available at http://www.fs.fed.us/database/feis/plants/index.html. Accessed 7 August 2007.

### Contributors

Tom Simper

### Approval

Kendra Moseley, 5/19/2025

### Rangeland health reference sheet

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

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|---|---|
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| Approved by | |
| Approval date | |
| Composition (Indicators 10 and 12) based on | Annual Production |

### Indicators

1. **Number and extent of rills:** **None on flatter slopes (0-5%), none to rare on sites with steeper slopes (>5%). Rills are expected on sites that are adjacent to landscape settings where increased runoff may accumulate (such as areas below exposed bedrock). Such rill development should usually be limited to slopes exceeding 5% and adjacent to sites where runoff accumulation occurs (i.e. exposed bedrock, small watersheds, steep sites,etc.) Rills heal rapidly due to the coarse soil textures and frost heaving action over a couple of winters. Any rills present should be somewhat short in length. An increase in rill formation may be seen after recent large thunderstorms.**

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2. **Presence of water flow patterns:** **Flow patterns wind around perennial plant bases and show little to slight evidence of erosion. They are short and stable and there is minor evidence of deposition. On gently sloping (< 5 % slopes) locations within the site, water flow patterns are infrequent and usually less than 3 feet in length. Longer (>3 feet) water flow patterns may be found on steeper slopes (>5%). They are narrow (<1 foot wide) and widely spaced (10-20 yards)**

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3. **Number and height of erosional pedestals or terracettes:** **Plants may rarely show little pedestalling, but there should not be any exposed roots. Shrubs normally have coppice mounding up to 4 inches caused by deposition of wind borne sediments, do not misinterpret these as pedestals. Terracettes should be few, occurring in waterflow patterns obstructed by woody litter. Any rare pedestals that occur are usually associated with natural wind erosion, and should not have exposed roots. Interspaces between well developed biological soil crusts may resemble pedestals but they are actually a characteristic of the crust formation.**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** **45-55% bare ground. Ground cover is based on the first raindrop impact, and bare ground is the opposite of ground cover. Any well developed biological crusts present should not be recorded as bare ground. Poorly developed biological soil crusts that are interpreted as functioning as bare ground (therefore they would be susceptible to raindrop splash erosion) should be recorded as bare ground.**

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5. **Number of gullies and erosion associated with gullies:** **None to rare. Some gullies may be present in landscape settings where increased runoff may accumulate (such as areas below exposed bedrock). Such gully development is expected to be limited to steeper slopes adjacent to sites where runoff accumulation occurs. Any gullies present should show little sign of accelerated erosion and should be stabilized with perennial vegetation.**

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6. **Extent of wind scoured, blowouts and/or depositional areas:** **Very minor wind generated soil movement is normal. Wind caused blowouts and deposition are generally stable or have healed over. Coppice mounding around Spiny hopsage and other shrubs is common. Increased wind generated soil movement can occur during severe wind events.**

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7. **Amount of litter movement (describe size and distance expected to travel):** **Most litter resides in place with some redistribution caused by water and wind movement. Very minor litter removal may occur in flow patterns and rills with deposition occurring at points of obstruction. The majority of litter accumulates at the base of plants. Some grass leaves and small twigs (grass stems) may accumulate in soil depressions adjacent to plants. Woody stems are not likely to move.**

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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):** **This site should have a soil stability rating of 4 or 5 under the plant canopies and a rating of 3 to 4 in the interspaces using the soil stability kit test. The average should be a 4. Surface texture varies from loamy fine sand to fine sandy loam. Vegetation cover, litter, biological soil crusts and surface rock reduce erosion.**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** **Soil surface horizon is typically 2 inches deep. Structure is typically weak thin platy parting to weak fine granular. Color is typically light brown to (7.5YR6/4). Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** **Vascular plants and any well developed biological soil crusts will break raindrop impact and splash erosion. Spatial distribution of vascular plants and interspaces between well developed biological soil crusts (where present) provide detention storage and surface roughness that slows runoff allowing time for infiltration. Interspaces between plants and any well developed biological soil crusts (where present) may serve as water flow patterns during episodic runoff events, with natural erosion expected in severe storms. When perennial grasses decrease, reducing ground cover and increasing bare ground, runoff is expected to increase and any associated infiltration reduced.**

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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. A few soils have bedrock at about 30+ inches. Naturally occurring soil horizons may be harder than the surface because of an accumulation of clay or calcium carbonate and should not be considered as compaction layers.**

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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: sprouting shrubs (spiny hopsage, mormontea) > non sprouting shrubs (Blackrush, Fourwing saltbush, Winterfat)**

    **Sub-dominant: warm season perennial grasses (Galleta, Sand dropseed, Blue grama) >= cool season perennial grasses (Indian ricegrass, Needle and Thread) > forbs > Biological soil crusts**

    **Other: Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species in the reference state (e.g. Crested wheatgrass and Russian wildrye etc.). Biological soil crust is variable in it's expression where present on this site and is measured as a component of ground cover. Forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.**

    **Additional: Temporal variability factors include insects, drought, and infrequent fire. Spatial variability factors include soil texture, slope, etc. Following a recent disturbance such as fire or drought that removes the woody vegetation, forbs and perennial grasses (herbaceous species) may dominate the community. If a disturbance has not occurred for an extended period of time, woody species may continue to increase crowding out the perennial herbaceous understory species. In either case, these conditions reflect a community phase within the reference state.**

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** **During years with average to above average precipitation, there should be very little recent mortality or decadence apparent in either the shrubs or grasses. Some mortality of bunchgrass and other shrubs may occur during very severe (long term) droughts.**

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14. **Average percent litter cover (%) and depth ( in):** **Litter cover (including under plants) nearly all of which should be fine litter. Depth should be 1 leaf thickness in the interspaces and up to 1/2" under canopies. Litter cover may increase to 20% on some years due to increased plant production.**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** **450 - 500 #/acre on an average year**

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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, Broom snakeweed & introduced annual forbs (Filarie, Russian thistle).**

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17. **Perennial plant reproductive capability:** **All perennial plants should have the ability to reproduce sexually or asexually in most years, except in drought years.**

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