USDA Natural Resources Conservation Service

# Ecological site R034BY018UT
# Semiwet Fresh Streambank (Fremont Cottonwood)

Last updated: 3/05/2022
Accessed: 05/15/2024

## 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.

## MLRA notes

Major Land Resource Area (MLRA): 034B–Warm Central Desertic Basins and Plateaus

MLRA 34B occurs in is in Utah (70 percent) and Colorado (30 percent). It makes up about 12,850 square miles (33,290 square kilometers). A small part of the area is in the High Plateaus of Utah Section of the Colorado Plateaus Province of the Intermontane Plateaus. The northern part of the MLRA occurs in the Uinta Basin Section, which is bounded by the Uinta Mountains to the north, the Wasatch Range to the west, the Roan Plateau to the south, and the Rabbit Hills to the east. The southern part of the MLRA occurs in the northern third of the Canyon Lands Section. This section is bounded by the Roan Plateau to the north, the Wasatch Plateau to the west, the southern end of the San Rafael Swell to the south, and the western slope of the Rocky Mountains to the east. Elevation ranges from 4,100 feet (1,250 meters) near Green River, Utah, to 7,500 feet (2,285 meters) at the base of the Wasatch Range and the Roan Plateau.

Most of this area is covered by residual basin-floor materials and materials washed in from the surrounding mountains and plateaus. Shale and sandstone are the dominant rock types. The Tertiary-age Green River, Uinta, and Duchesne Formations dominate the northern part of the MLRA. The southern part is dominated by Cretaceous-age materials with lesser amounts of Jurassic and Triassic materials. The dominant Cretaceous formations are Mancos Shale, Dakota Sandstone, and the members of the Mesa Verde Group. The dominant Jurassic formations are the Morrison, Entrada, and Navajo. The dominant Triassic formations are the Chinle and Moenkopi. Quaternary alluvial, eolian, and glacial deposits occur in both parts of the MLRA.

The average annual precipitation in most of this area ranges from 6 to 10 inches (150 to 255 millimeters). A small part of this area receives as much as 24 inches of annual precipitation.
Much of the precipitation occurs as high-intensity, convective thunderstorms during the period July through September. May and June are usually the drier months. Precipitation is more evenly distributed throughout the year in the northern part of the MLRA than in the southern part, where there is a significant peak in late summer. The northern part of the MLRA receives more precipitation as snow during winter than the southern part. The average annual temperature ranges from 41 to 54 degrees F (5 to 12 degrees C). The freeze-free period averages 170 days and ranges from 110 to 235 days.

The dominant soil orders in this MLRA are Aridisols and Entisols. Mollisols occur at the higher elevations, particularly in the northern part of the MLRA. The dominant soil temperature regime is mesic, and the dominant soil moisture regime is aridic. The soils receiving less than 8 inches (205 millimeters) of precipitation annually have an aridic soil moisture regime. The soils receiving 8 to 12 inches (205 to 305 millimeters) have an aridic soil moisture regime that borders on ustic. The soils receiving 12 to 16 inches (305 to 405 millimeters) generally have an ustic soil moisture regime that borders on aridic. The dominant soil mineralogy is mixed and soils are formed in slope alluvium or residuum derived from shale or sandstone. Many of the soils are shallow or moderately deep to shale or sandstone bedrock. The soils at the lower elevations generally have significant amounts of calcium carbonate, salts, and gypsum.

## Ecological site concept

The soils of this site formed mostly in alluvium from metamorphic and sedimentary rock. Surface soils are fine sandy loam to loam in texture. Rock fragments may be present on the soil surface and throughout the profile, but make up less than 35 percent of the soil volume. These soils are deep to very deep, moderately well-drained, and have moderate to moderately rapid permeability. pH is slightly to moderately alkaline.. Available water-holding capacity ranges from 3.5 to 6 inches of water in the upper 60 inches of soil. The soil moisture regime is mostly ustic and the soil temperature regime is mesic. Precipitation ranges from 5-12 inches annually.

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | (1) *Populus fremontii* |
| Shrub | Not specified |
| Herbaceous | Not specified |

## Physiographic features

This site occurs on flood-plain step.

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Alluvial plain > Flood-plain step |
| Runoff class | Very low to low |
| Flooding duration | Brief (2 to 7 days) |
| Flooding frequency | None to rare |
| Elevation | 1,219–1,829 m |
| Slope | 0–3% |
| Ponding depth | Not specified |
| Water table depth | 76–122 cm |
| Aspect | W, NW, N, NE, E, SE, S, SW |

## Climatic features

The climate is cold and snowy in the winter and warm and rainy in the summer. On the average the wettest months are march through July and the driest months are August through February. Average annual precipitation is 5 to 12 inches. The mean annual air temperature is 7 to 8 degrees Celsius and the soil temperatures are in the mesic regime

**Table 3. Representative climatic features**

| | |
|---|---|
| Frost-free period (characteristic range) | |
| Freeze-free period (characteristic range) | 120-150 days |
| Precipitation total (characteristic range) | 127-305 mm |

## Influencing water features

This site is occasionally flooded during high runoff and are affected by a fluctuating water table (30 to 48 inches in depth) during parts of the plant growing season.

## Soil features

The soils of this site formed mostly in alluvium from metamorphic and sedimentary rock. Surface soils are fine

sandy loam to loam in texture. Rock fragments may be present on the soil surface and throughout the profile, but make up less than 35 percent of the soil volume. These soils are deep to very deep, moderately well-drained, and have moderate to moderately rapid permeability. pH is slightly to moderately alkaline.. Available water-holding capacity ranges from 3.5 to 6 inches of water in the upper 60 inches of soil. The soil moisture regime is mostly ustic and the soil temperature regime is mesic. Precipitation ranges from 5-12 inches annually.

**Table 4. Representative soil features**

| | |
|---|---|
| Parent material | (1) Alluvium–sedimentary rock<br>(2) Alluvium–metamorphic rock |
| Surface texture | (1) Loam<br>(2) Fine sandy loam |
| Family particle size | (1) Coarse-loamy |
| Drainage class | Somewhat poorly drained to moderately well drained |
| Permeability class | Moderate to moderately rapid |
| Depth to restrictive layer | 152 cm |
| Soil depth | 152 cm |
| Surface fragment cover <=3" | 0–5% |
| Surface fragment cover >3" | 0% |
| Available water capacity (Depth not specified) | 8.89–15.24 cm |
| Calcium carbonate equivalent (Depth not specified) | 5–15% |
| Electrical conductivity (Depth not specified) | 0–4 mmhos/cm |
| Sodium adsorption ratio (Depth not specified) | 2–10 |
| Soil reaction (1:1 water) (Depth not specified) | 7.4–8.4 |
| Subsurface fragment volume <=3" (Depth not specified) | 0–6% |
| Subsurface fragment volume >3" (Depth not specified) | 0–2% |

## Ecological dynamics

Community Phase 1.1: Reference State
The Reference State is a description of this ecological site just prior to Euro-American settlement but long after the arrival of Native Americans. The description of the Reference State was determined by NRCS Soil Survey Type Site Location information and familiarity with rangeland relict areas where they exist. The Reference State would have been in any of three phases depending on stream gradient and how recently fire had occurred or when beavers had last been present. Along steeper stream gradients, succession would have rapidly proceeded from low-statured graminoids (1.1), to shrubs (1.2), and lastly to trees that reproduce in their own shade (1.3). A complete list of species by lifeform for the Reference State is available in accompanying tables in the “Plant Community Composition by Weight and Percentage” section of this document. Along gentle gradients beavers would have consumed all the largely deciduous woody stems and constructed dams. Once the nearby food and building materials were exhausted, the colony of beavers would have moved to another reach of the stream, making the abandoned dams and depleted stretch vulnerable to blow out from the next large convectional storm. This phase is short since most of the woody species re-sprout and are dominant again within a decade or so.

The resulting drop in the water table would have stressed the moisture-demanding woody species and favored the graminoids, allowing the graminoids to eventually reclaim the drier streamside banks. Thus, rather than one plant community becoming stable, these stretches of stream would have been in a continual state of change. Fur

trapping in the 1820s-1830s resulted in the reduction of beaver by about 95% . Without these animals to maintain their stair-step configuration of dams, the whole hydrologic regime of these drainages changed. What were once small perennial streams became ephemeral, and succession was truncated. Beaver have not returned in number until recent decades (when the fur trade diminished and furbearers began to be raised on farms). Thus, by the time of the European settlement period, huge changes in these systems had already taken place.

Community Phase 1.1: graminoid dominance (rushes & sedges)
This early seral phase would have been dominated by rushes (Juncus spp.). Heavy local utilization by browsers or beaver would have kept back the woody species, allowing this graminoid phase to persist.

Community Pathway 1.1a:
Along gentler stream gradients, ponding caused by construction of beaver dams would have brought the water table up in areas that would have otherwise been dry. Heavy grazing by bison and/or elk would have reduced the graminoids, giving way first to some taller forbs. The same successional process would have taken place along steeper gradients, but at a more rapid rate.

Community Phase 1.2: mesic shrub dominance
A set of mesic shrubs including willow and/or basin big sagebrush would have quickly overtopped the graminoids, unless shrubs were cropped by moose or beaver.

Community Pathway 1.2a:
The presence of cottonwood seeds being carried by water would have provided for the rapid succession from shrubs to a gallery forest.

Community Pathway 1.2b:
As the supply of palatable deciduous shrubs and trees increased, beaver numbers would also have increased. With time, a heavy concentration of beaver and moose would have reduced the woody component, with the exception of the less palatable shrubs causing the canopy to open up.

Community Phase 1.3: gallery forest
Without beaver, tree cutting, and/or fire, a thick streamside (gallery) forest dominated by shade-tolerant cottonwood would have developed.

Community Pathway 1.3a:
A strong convectional storm associated with flash flooding would have blown out existing beaver dams. Unless the beavers were still occupying the area and rebuilt their dams, the water table would have eventually returned to previously lower levels. This would have allowed the graminoids to reclaim the site. Wildfire would have had a similar effect by removing most of the woody vegetation and debris, thereby re-opening the site to graminoids.

Community Pathway 1.3b:
This community pathway would be similar to 1.2b, except less intense. Flash flooding may blow out existing beaver dams following convectional storm events, but some smaller-statured trees and shrubs would persist, leaving enough woody material such that beavers could subsist and rebuild their dams.

Transition T1a: from State 1 to State 2 (Reference State to Xerified Shrub and Tree Dominated Drained State)
The simultaneous introduction of European livestock and exotic plant species, the near extirpation of beaver along with its influence on the hydrologic regime, and a warmer drier climate were all factors involved in the transition to State 2. A return to State 1 would not be impractical because of these issues.

Community Phase 2.2: Xerified Shrub and Tree Dominated Drained State
State 2 is similar to State 1 in form and function, with the exception of the presence of non-native plants and animals, possible extinctions, and a different climate. State 2 is a description of the ecological site shortly following Euro-American settlement. This state can be regarded as the current potential. Depending on the size of the watershed above, the stream could well have changed from a perennial to ephemeral drainage. Many of the same species of plants found in the Reference State continue to exist in the latter situation because of hyporheic (i.e. below ground) movement of water, although the period of greenery and its productivity are lessened. The introduction of cattle put pressure on the graminoids (2.1a) and hastened the conversion to shrubs (2.2). The lack of beaver dams meant that sediment moved more rapidly downstream with flashy (short duration, high intensity)

precipitation events. Stream channelization occurred with increased rates of flow, leading to xerification of the streamside. With beaver temporarily absent, livestock numbers relatively reduced due to lack of forage, and lack of natural disturbances (2.2a), the shrubs and trees grow larger and shade out many of the forage species favored by livestock (2.3). The most disturbed phase of this State would be the graminoid-dominant phase (2.1), which occurs if moose effectively browse out the shrubby vegetation (2.2b). Kentucky bluegrass (*Poa pratensis*) was introduced at some sites for livestock forage; however it is not capable of holding the stream banks together during convectional storms.

Community Phase 2.1: graminoid dominance
This graminoid-dominated phase is frequently dominated by Kentucky bluegrass. The Forest Service regards this as an introduced species, but it is preferred by livestock over other native graminoids. It is, however, less able to protect stream banks than its native counterparts because of its shallower, weaker roots.

Community Pathway 2.1a:
Heavy season-long use by cattle will diminish the grass component and allow an increase in tall forbs. Sheep will consume most of the forbs and shrubs, but will leave the less palatable ones.

Community Phase 2.2: mesic shrub dominance
This plant community will be dominated by unpalatable mesic shrubs with an understory of unpalatable herbs including thistles and horsetail. Species composition will depend upon the type of livestock utilizing the area.

Community Pathway 2.2a:
Without sheep and/or beaver consumption of shrubs and sapling trees, the shrub phase quickly transforms to a gallery forest.

Community Pathway 2.2b:
Browsing of palatable woody species will cause a retardation of the shift to shrub and tree dominance.

Community Phase 2.3: gallery forest
This plant community is dominated by cottonwood, a shade-tolerant species, which will persist in the absence of wildfire, wood cutting, and/or large storm events.

Community Pathway 2.3a:
A gallery forest can persist in the absence of fire or wood cutting, creating a jack-strawing of downed trees that will make access to the site difficult for large animals.

Transition T2a: from State 2 to State 3 (Xerified Shrub and Tree Dominated Drained State to Improved Pasture State)
Since there is diminished forage production in the woody plant-dominated phases of State 2, some private landholders have, through prescribed fire and mechanical treatments, cleared out the streamside vegetation and planted exotic species such as smooth brome or crested wheatgrass to replace the native species.

State 3: Improved Pasture State

Community Phase 3.3: Improved Pasture State
Some private land owners have bulldozed the streamside vegetation to remove trees needed by beavers to pond up the stream and/or to remove shade to increase forage production for livestock. Introduced species such as crested wheatgrass and smooth brome have been planted as the site became xerified, but more conducive to cattle grazing. The early seral vegetation created constitutes Phase 3.1. With time and heavy cattle grazing (3.1a), the tendency is for the original shrubs and trees to return (3.2). If introduced grass dominance is desired, mechanical or chemical retreatment to reduce the woody plants will be required (3.2a).

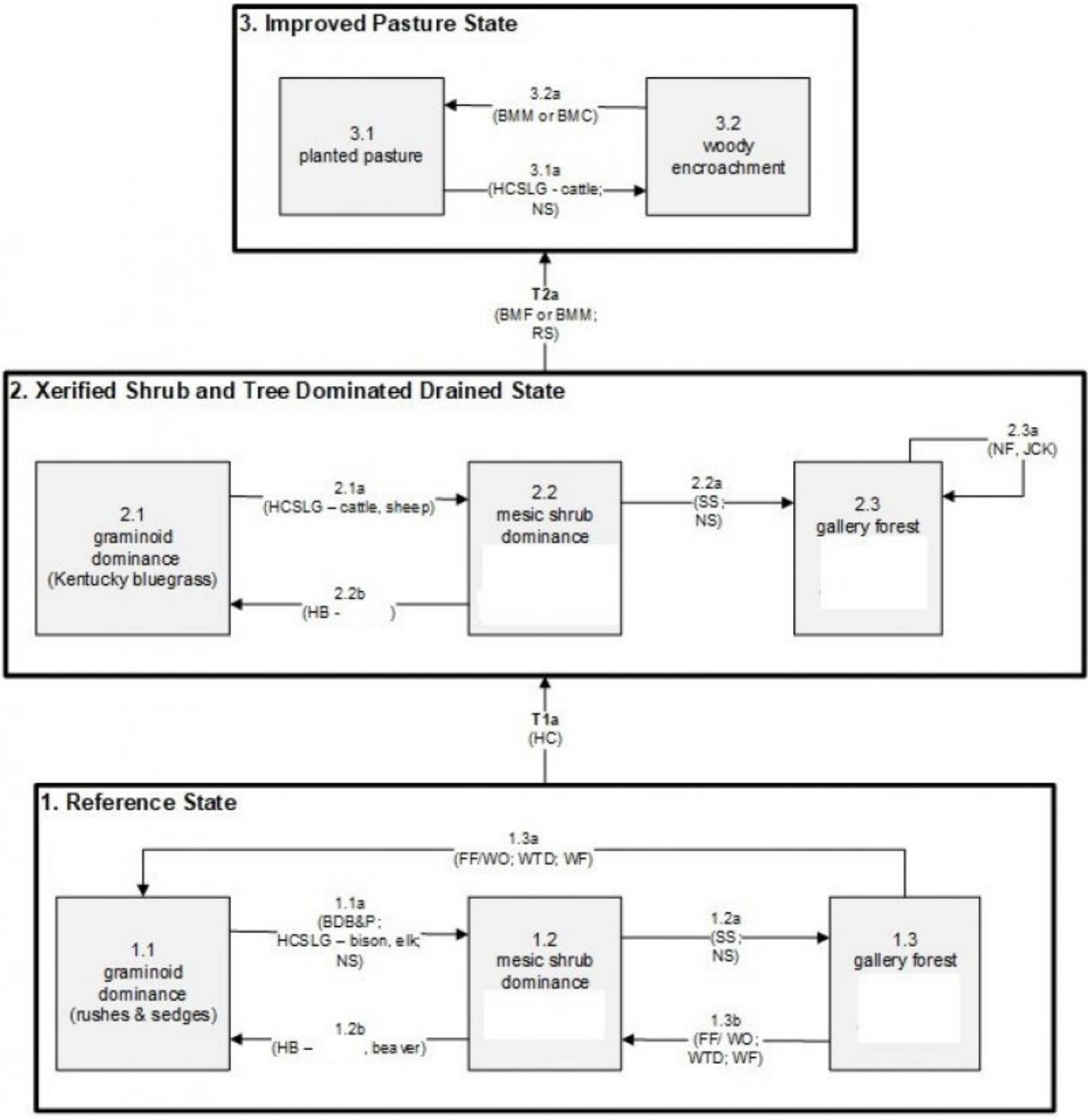
Community Phase 3.1: planted pasture
This plant community will be dominated by introduced species such as crested wheatgrass and smooth brome.

Community Pathway 3.1a:
In order to maintain an herbaceous-dominant phase, the native woody species may require re-treatment using mechanical or chemical means.

Community Phase 3.2: woody encroachment
This plant community will be a mix of introduced grasses and native shrubs that have re-established following a period of heavy continuous season-long grazing.

Community Pathway 3.2a:
Some re-establishment of native shrubs will occur if the site is heavily grazed during the growing season of the grasses.

## State and transition model




| | |
|---|---|
| BDB&P | Beaver Dam Building & Ponding |
| BMC | Brush Management (chemical) |
| BMF | Brush Management (fire) |
| BMM | Brush Management (mechanical) |
| FF/WO | Flash Flood/Washout |
| HB | Heavy Browsing |
| HC | Historic Change |

| | |
|---|---|
| HCSLG | Heavy Continuous Season Long Grazing |
| JCK | Jack-strawing (downed old trees) |
| NF | No Fire |
| NS | Natural Succession |
| RS | Reseed |
| SS | Seed Source |
| WF | Wildfire |
| WTD | Water Table Drop |

## Approval

Kirt Walstad, 3/05/2022

## 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 | 05/15/2024 |
| Approved by | Kirt Walstad |
| 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):**

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

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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

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

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

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

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17. **Perennial plant reproductive capability:**

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