Ecological site EX044B01C060
Overflow (Ov) 15-19" PZ
Frigid
North

Last updated: 3/03/2025
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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 044B–Central Rocky Mountain Valleys

Major Land Resource Area (MLRA) 44B, Central Rocky Mountain Valleys, is nearly 3.7 million acres of southwest Montana. This MLRA borders two other MLRAs: 43B, Central Rocky Mountains and Foothills, and 46, Northern and Central Rocky Mountain Foothills. The major watersheds of this MLRA are the Missouri and Yellowstone Rivers and their associated headwaters, such as the Beaverhead, Big Hole, Jefferson, Ruby, Madison, Gallatin, and Shields Rivers. Limited portions of the MLRA are west of the Continental Divide along the Clark Fork River. These waters allow for extensive irrigation for crop production in an area that is generally only compatible with rangeland and grazing. The Missouri River and its headwaters are behind several reservoirs used for irrigation water, hydroelectric power, and municipal water. The primary land use of this MLRA is production agriculture (grazing, small grain production, and hay) with limited mining. Urban development is high, with large expanses of rangeland being converted to subdivisions for a rapidly growing population. MLRA 44B consists of one Land Resource Unit (LRU) and seven (7) Climate-based LRU subsets. Annual precipitation ranges from a low of nine (9) inches to a high of near 24 inches. The driest areas tend to be in the valley bottoms of southwest Montana, in the rain shadow of the mountains. The wettest portions tend to be near the edges of the MLRA, where it borders MLRA 43B. Frost-free periods also vary greatly, with less than 30 days in the Big Hole Valley to approximately 110 days in the warm valleys along the Yellowstone and Missouri Rivers. MLRA 44B’s plant communities are highly variable but are dominated by a cool-season grass and shrub-steppe community on the rangeland and a mixed coniferous forest in the mountains. Warm-season grasses occupy an extremely limited extent and number of species in this MLRA. Most subspecies of big sagebrush are present, to some extent, across the MLRA.

LRU notes

LRU 01 Subset C Central Concept: • Moisture Regime: Ustic • Temperature Regime: Frigid • Dominant Cover: rangeland (mixed grassland and sagebrush steppe) • Representative Value (RV) of range of Effective Precipitation: 15 to 19 inches • Representative Value (RV) of range of Frost Free Days: 75 to 105days This LRU subset exists in northern portion of MLRA 44B particularly in Meagher, Powell, Broadwater, Lewis and Clark, Granite, and Deer Lodge Counties.

Classification relationships

Mueggler and Stewart. 1980. Grassland and Shrubland habitat types of Western Montana 1. Stipa comata/Bouteloua gracilis h.t. 2. Agropyron spicatum/Bouteloua gracilis h.t. 3. Festuca scabrella/Agropyron spicatum h.t. 4. Artemisia tridentata/Festuca scabrella h.t. EPA Ecoregions of Montana, Second Edition: Level I: Northwestern Forested Mountains Level II: Western Cordillera Level III: Middle Rockies & Northern Great Plains Level IV: Paradise Valley Townsend Basin Dry Intermontane Sagebrush Valleys Level I: Great Plains Level II: West-Central Semi-Arid Prairies Level III: Northwestern Great Plains Level IV: Shield-Smith Valleys Non-calcareous Foothill Grassland

Ecological site concept

• Site receives additional effective offsite water however additional moisture is not associated with a water table • Soils are o Generally not saline or saline-sodic o Moderately deep, deep, or very deep o Typically less than five (5) percent stone and boulder cover (15 percent maximum) o Soil surface texture ranges from loam to clay loam in surface mineral four (4) inches. • Parent material is alluvium

Associated sites

EX044B01C032	**Loamy (Lo) 15-19" PZ Frigid North** The Loamy ecological site is often a neighboring site with similar plant community.

Similar sites

EX044B01C032	**Loamy (Lo) 15-19" PZ Frigid North** The Loamy ecological site is often a neighboring site with similar plant community. The Loamy site does not receive additional moisture so production is often lower with drier plant species most common.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata* (2) *Symphoricarpos albus*
Herbaceous	(1) *Leymus cinereus* (2) *Festuca campestris*

Legacy ID

R044BC060MT

Physiographic features

This ecological site occurs mostly in narrow, ephemeral drainage ways, swales, and floodplains. This location on the landscape allows for the site to receive additional moisture in the form of runoff from adjacent sites as a result of a precipitation event and not as a result of a water table. Slopes are typically gentle and rarely exceed 15 percent. Landform shape is either concave (across the slope) and linear (downslope) or a combination of both concave slope shapes (swale).

Table 2. Representative physiographic features

Slope shape across	(1) Concave
Slope shape up-down	(1) Linear (2) Concave
Landforms	(1) Intermontane basin > Flood plain (2) Intermontane basin > Drainageway (3) Intermontane basin > Swale
Flooding duration	Extremely brief (0.1 to 4 hours) to brief (2 to 7 days)
Elevation	1,370 – 1,830 m

Slope	0 – 20 %
Water table depth	100 cm
Aspect	Aspect is not a significant factor

Climatic features

The Central Rocky Mountain Valleys MLRA has a continental climate. 50 to 60 percent of the annual long-term average total precipitation falls between May and August with the highest in May and June. Most of the precipitation in the winter is snow on frozen ground. Average precipitation for LRU 01 Subset C is 15 inches, and the frost-free period averages 75 to 105 days.

Table 3 Representative climatic features

Frost-free period (characteristic range)	80-110 days
Freeze-free period (characteristic range)	110-140 days
Precipitation total (characteristic range)	360-430 mm
Frost-free period (actual range)	80-110 days
Freeze-free period (actual range)	110-140 days
Precipitation total (actual range)	330-510 mm
Frost-free period (average)	90 days
Freeze-free period (average)	120 days
Precipitation total (average)	380 mm

- (1) WILSALL 8 ENE [USC00249023], Wilsall, MT
- (2) ANACONDA [USC00240199], Anaconda, MT
- (3) AUSTIN 1 W [USC00240375], Helena, MT
- (4) PHILIPSBURG RS [USC00246472], Philipsburg, MT
- (5) LENNEP 5 SW [USC00244954], White Sulphur Springs, MT
- (6) BOZEMAN MONTANA ST U [USC00241044], Bozeman, MT

Influencing water features

The site exists in ephemeral drainageways and swales where additional water is received in response to precipitation events. Surface and subsurface water flow off neighboring areas. The site may have a water table greater than 40 inches deep and, if present, is very seasonal in nature.

Wetland description

This site receives additional soil moisture; however, this is extremely brief. This briefness does not allow for hydric soils or hydrophytic plants to be expressed. Both surface and subsurface water may flow beyond this ecological site into neighboring wetland sites.

Soil features

The soils associated with this ecological site are moderately deep to very deep with moderate permeability. The parent material is alluvium. These soils are non-hydric. Typical soil surface textures are variable with loam or clay loam surface textures. The common soils series in this ecological site includes Work and Pachel. These soils may exist across multiple ecological sites due to natural variations in slope, texture, rock fragments, and pH.

Table 4. Representative soil features

Parent material	(1) Alluvium – igneous, metamorphic and sedimentary rock
Surface texture	(1) Loam (2) Clay loam
Family particle size	(1) Fine (2) Fine-loamy
Drainage class	Well drained
Permeability class	Moderate to moderately slow
Depth to restrictive layer	50 – 250 cm
Surface fragment cover <=3"	0 – 10 %
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	13.97 – 18.03 cm
Soil reaction (1:1 water) (0-101.6cm)	7.8 – 8.4
Subsurface fragment volume <=3" (25.4-50.8cm)	0 – 10 %

Subsurface fragment volume >3" (25.4-50.8cm)	Not specified

Ecological dynamics

The reference plant community is dominated by basin wildrye (Leymus cinereus), rough fescue (Festuca campestris), bluebunch wheatgrass (Pseudoroegneria spicata), green needlegrass (Nassella viridula), western wheatgrass (Pascopyrum smithii), and thickspike wheatgrass (Elymus lanceolatus). Subdominant species may include big sagebrush (Artemisia tridentata), slender wheatgrass (Elymus trachycaulus), snowberry (Symphoricarpos albus), and rose (Rosa woodsii). This potential is suggested by investigations showing a predominance of perennial grasses on near-pristine range sites (Ross et al., 1973). Natural variability within the reference state can be high with long-term seasonal dry cycles, promoting a plant community similar to the Loamy ecological site, while wet cycles promote a more productive basin wildrye and green needlegrass dominated system.

As the community changes away from reference, rhizomatous grasses tend to increase. If allowed to continue, non-native sod-forming grasses such as Kentucky bluegrass (Poa pratensis) and quackgrass (Elymus repens) tend to take over the site. These species are extremely competitive and are difficult to control once established. Throughout this time, bare ground tends to be relatively low; in fact, a sodbound site may actually have less bare ground than the reference. However, due to the short-rooted nature of the sod-forming grasses, headcutting and gully erosion can occur.

Historical records indicate that, prior to the introduction of livestock (cattle and sheep) during the late 1800s, elk and bison grazed this ecological site. Due to the nomadic nature and herd structure of bison, areas that were grazed received periodic, high-intensity, short-duration grazing pressure. The gold boom in the 1860s brought the first herds of livestock overland from Texas, and homesteaders began settling the area. During this time, cattle were the primary domestic grazers in the area. In the 1890s, Montana sheep production began to increase and dominated the livestock industry until the 1930s. Since the 1930s, cattle production has dominated the livestock industry in the region (Wyckoff and Hansen 2001).

Natural fire was a major ecological driver of this entire ecological site. Fire tended to prevent tree and shrub growth in large areas and restrict it to small patches, which promoted an herbaceous plant community. The natural fire return interval was, however, likely shorter than 35 years (Arno and Gruell 1983).

Some of the major invasive species that can occur on this site include (but are not limited to) spotted knapweed (Centaurea stoebe), leafy spurge (Euphorbia esula), sulphur cinquefoil (Potentilla recta), Canada thistle (Cirsium arvense), dandelion (Taraxicum spp.), quackgrass (Elymus repends), and Kentucky bluegrass (Poa pratensis). Cheatgrass (Bromus techtorum), however, has become a dominant invasive species in recent years.

Plant Communities and Transitions
A state and transition model (STM) for this ecological site is depicted below. Thorough descriptions of each state, transition, plant community, and pathway follow the model. This model is based on available experimental research, field data, field observations, and interpretations by experts. It is likely to change as knowledge increases.

The plant communities within the same ecological site will differ across the MLRA due to the naturally occurring variability in weather, soils, and aspect. The biological processes on this site are complex; therefore, representative values are presented in a land management context. The species lists are representative and are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are intended to cover the core species and known range of conditions and responses.

Both percent species composition by weight and percent canopy cover are referenced in this document. Canopy cover drives the transitions between communities and states because of the influence of shade, the interception of rainfall, and the competition for available water. Species composition by dry weight remains an important descriptor of the herbaceous community and of the community as a whole. Woody species are included in the species composition for the site. Calculating the similarity index requires species composition by dry weight.

Although there is considerable qualitative experience supporting the pathways and transitions within the state and transition model (STM), no quantitative information exists that specifically identifies threshold parameters between grassland types and invaded types in this ecological site. For information on STMs, see the following citations: Bestelmeyer et al. (2003), Bestelmeyer et al. (2004), Bestelmeyer and Brown (2005), and Stringham et al. (2003).

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 (%)
Grass/Grasslike					
1	**Decreaser Bunchgrass/Grasslike**			2102-2522	
	basin wildrye	LECI4	*Leymus cinereus*	841-1457	15-30
	rough fescue	FECA4	*Festuca campestris*	135-448	5-10
	green needlegrass	NAVI4	*Nassella viridula*	140-308	3-7
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	135-269	3-5
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	0-196	0-10
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	0-168	0-5
	needlegrass	ACHNA	*Achnatherum*	0-140	0-5
	Nebraska sedge	CANE2	*Carex nebrascensis*	0-140	0-5
2	**Rhizomatous Grass/Grasslike**			280-420	
	western wheatgrass	PASM	*Pascopyrum smithii*	0-420	0-10
	thickspike wheatgrass	ELLA3	*Elymus lanceolatus*	0-420	0-10
	plains reedgrass	CAMO	*Calamagrostis montanensis*	56-112	1-3
	arctic rush	JUAR2	*Juncus arcticus*	0-28	0-1
3	**Increaser Bunchgrass/Grasslike**			140-280	
	needle and thread	HECO26	*Hesperostipa comata*	0-168	0-15
	Sandberg bluegrass	POSE	*Poa secunda*	0-84	0-10
	prairie Junegrass	KOMA	*Koeleria macrantha*	0-84	0-6
	clustered field sedge	CAPR5	*Carex praegracilis*	0-84	0-3
Shrub/Vine					
4	**Shrub**			179-336	
	shrubby cinquefoil	DAFR6	*Dasiphora fruticosa*	11-224	0-10
	common snowberry	SYAL	*Symphoricarpos albus*	11-168	3-10
	big sagebrush	ARTR2	*Artemisia tridentata*	45-140	5-15
	Woods' rose	ROWO	*Rosa woodsii*	0-56	0-3
	silver buffaloberry	SHAR	*Shepherdia argentea*	0-56	0-3
	currant	RIBES	*Ribes*	0-56	0-3
Forb					
5	**Forb**			163-286	
	lupine	LUPIN	*Lupinus*	67-179	3-6
	American vetch	VIAM	*Vicia americana*	45-112	0-5
	goldenbanner	THERM	*Thermopsis*	22-78	1-5
	silverweed cinquefoil	ARAN7	*Argentina anserina*	22-67	0-3
	cinquefoil	POTEN	*Potentilla*	11-67	0-3
	common yarrow	ACMI2	*Achillea millefolium*	22-56	1-3
	Rocky Mountain iris	IRMI	*Iris missouriensis*	0-56	0-3
	Indian paintbrush	CASTI2	*Castilleja*	22-56	1-3
	mountain deathcamas	ZIEL2	*Zigadenus elegans*	0-45	0-1
	lousewort	PEDIC	*Pedicularis*	0-22	0-1
	violet	VIOLA	*Viola*	0-22	0-1

Table 6. Community 1.2 plant community composition

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

Table 7. Community 2.1 plant community composition

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

Table 8. Community 3.1 plant community composition

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

Table 9. Community 3.2 plant community composition

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

Animal community

The Overflow (Ov) ecological site of the Central Rocky Mountains Valleys provides a variety of wildlife habitat for an array of species. Prior to the settlement of this area, large herds of antelope, elk, and bison roamed. Though the bison that once utilized this landscape have been replaced with domestic livestock, wildlife still utilizes this largely intact landscape for habitat. The relatively high grass component of the Reference Community provides excellent nesting cover for multiple neotropical migratory birds as well as hiding habitat for larger animals. Greater sage grouse likely utilize most states of this ecological site as there are high amounts of forbs and insects as a result of the favorable soil moisture. Even in an Altered State, sage grouse will utilize the increased forb and shrub cover for both foraging and hiding cover. This site would be considered critical habitat for most lifestages of the greater sage grouse. Managed livestock grazing is suitable on this site due to the potential to produce an abundance of high-quality forage. This is often a preferred site for grazing by livestock, and animals tend to congregate in these areas. In order to maintain the productivity of this site, grazing on adjoining sites with less production must be managed carefully to make sure utilization on this site is not excessive. Management objectives should include maintenance or improvement of the native plant community. Careful management of the timing and duration of grazing is important. Shorter grazing periods and adequate deferment during the growing season are recommended for plant maintenance, health, and recovery. Continual non-prescribed grazing of this site will be injurious, will alter the plant composition and production over time, and will result in the transition to the Altered State. The transition to other states will depend on the duration of poorly managed grazing as well as other circumstances such as weather conditions and fire frequency. The Altered State is subject to further degradation to the Invaded State. Management should focus on grazing management strategies that will prevent further degradation, such as seasonal grazing deferment or winter grazing where feasible. Communities within this state are still stable and healthy under proper management. Forage quantity and/or quality may be substantially decreased from the Reference State. Grazing is possible in the Invaded State. Invasive species are generally less palatable than native grasses. Forage production is typically greatly reduced in this state. Due to the aggressive nature of invasive species, sites in the Invaded State face an increased risk of further degradation to the Invaded State. Grazing has to be carefully managed to avoid further soil loss and degradation and possible livestock health issues. Prescriptive grazing can be used to manage invasive species. In some instances, carefully targeted grazing (sometimes in combination with other treatments) can reduce or maintain the species composition of invasive species.

Hydrological functions

The hydrologic cycle functions best in the Reference State (1) with good infiltration and deep percolation of rainfall; however, the cycle degrades as the vegetation community declines. Rapid rainfall infiltration, high soil organic matter, good soil structure, and good porosity accompany high bunchgrass canopy cover. High ground cover reduces raindrop impact on the soil surface, which keeps erosion and sedimentation transport low. Water leaving the site will have a minimal sediment load, which allows for high water quality in associated streams. High rates of infiltration will allow water to move below the rooting zone during periods of heavy rainfall. The Decreaser Bunchgrass Community (1.1) should have no rills or gullies present, and drainage ways should be vegetated and stable. Water flow patterns, if present, will be barely observable. Plant pedestals are essentially nonexistent. Plant litter remains in place and is not moved by wind or water. Improper grazing management results in a community shift to the At Risk Community (1.2). This plant community has a similar canopy cover but slightly higher bare ground. Therefore, the hydrologic cycle is functioning at a level similar to the water cycle in the Decreaser Bunchgrass Community (1.1). In the Invaded State (3) canopy and ground cover are greatly reduced compared to the Reference State (1), which impedes the hydrologic cycle. Infiltration will decrease and runoff will increase due to reduced ground cover, the presence of shallow-rooted species, rainfall splash, soil capping, reduced organic matter, and poor structure. Sites invaded by non-native rhizomatous grasses are at a particularly high risk of runoff and headcutting. Sparse ground cover and decreased infiltration can combine to increase the frequency and severity of flooding within a watershed. Soil erosion is accelerated, the quality of surface runoff is poor, and sedimentation increases.

Recreational uses

This site provides some limited recreational opportunities for hiking, horseback riding, big game and upland bird hunting. The forbs have flowers that appeal to photographers. This site provides valuable open space.

Wood products

n/a

Inventory data references

Information presented was derived from the site's Range Site Description (Overflow 15-19" P.Z., Northern Rocky Mountain Valleys, South, East of Continental Divide), NRCS clipping data, literature, field observations, and personal contacts with range-trained personnel (i.e., used professional opinion of agency specialists, observations of land managers, and outside scientists).

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Approval

Grant Petersen, 3/03/2025

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.

Author(s)/participant(s)	Grant Petersen
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Date	03/08/2020

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

Indicators

1. **Number and extent of rills:** **Rills are not present in the reference condition.**

2. **Presence of water flow patterns:** **Water flow patterns are not present in the reference condition.**

3. **Number and height of erosional pedestals or terracettes:** **Pedestals are not evident in the reference condition.**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** **Bare ground is low (0-1 percent).**

5. **Number of gullies and erosion associated with gullies:** **Gullies are not present in the reference condition**

6. **Extent of wind scoured, blowouts and/or depositional areas:** **Wind scoured, or depositional areas are not evident in the reference condition.**

7. **Amount of litter movement (describe size and distance expected to travel):** **Litter movement is limited to high runoff events such as spring snowmelt and after convective storms. Typically herbaceous material movement is less than 3 to 5 feet in these high flow events. Outside of these extremes litter movement will not occur.**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** **The average soil stability rating is 5-6 under plant canopies and plant interspaces. The A horizon is 6-8 inches thick.**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** **Soil Structure at the surface is moderate, fine granular. A Horizon should be 6-8 inches thick with color, when wet, typically ranging in Value of 3 or less and Chroma of 2 or less. Local geology may affect color in which it is important to reference the Official Series Description (OSD) for characteristic range. https://soilseries.sc.egov.usda.gov/osdname.aspx**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Evenly distributed across the site, bunchgrasses improve infiltration while rhizomatous grass protects the surface from runoff forces. Infiltration of the Overflow ecological site is well drained but has a slow infiltration rate. An even distribution of tall & mid stature bunchgrasses (75-80%) of site production, cool season rhizomatous grasses (10%) along with a mix of shortgrass (5-10%), forbs (5-10%) and shrubs (5-10%).

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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):** A compaction layer is not present in the reference condition. Soil profile may contain an abrupt transition to an Argillic horizon which can be misinterpreted as compaction, however, the soil structure will be fine to medium subangular blocky, where a compaction layer will be platy or structureless (massive).

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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: Tall & Mid-statured, cool season, perennial bunchgrasses (basin wildrye, rough fescue, green needlegrass)

    Sub-dominant: Rhizomatous grasses ? shrubs > Increaser Bunchgrasses > forbs > subshrubs

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Mortality in herbaceous species is not evident. Species with bunch growth forms may have some natural mortality in centers is 3% or less.

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14. **Average percent litter cover (%) and depth (in):** Total litter cover ranges from 50 to 70 percent. Most litter is irregularly distributed on the soil surface and is less than .25 inch.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Imperial: Average 2900 lbs per acre. Low: 2200 High 3200 lbs per acre. Metric: Average 3250 kilograms per hectare. Low: 2466 kg/ha High: 3587 kg/ha Production varies based on effective precipitation and natural variability of soil properties for this ecological site.

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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:** Potential invasive (including noxious) species (native and non-native). Invasive species on this ecological site include (but not limited to) dandelion, annual brome spp., spotted knapweed, yellow toadflax, leafy spurge, Kentucky bluegrass, smooth brome Native species such as rocky mtn Juniper, big sagebrush, Sandberg's bluegrass, etc. when their populations are significant enough to affect ecological function, indicate site condition departure.

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17. **Perennial plant reproductive capability: In the reference condition, all plants are vigorous enough for reproduction either by seed or rhizomes in order to balance natural mortality with species recruitment.**
