Ecological site EX043B23C170
Steep Stony Upland (SStU)
Absaroka Subalpine Zone

Last updated: 10/04/2019
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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): 043B–Central Rocky Mountains

Major Land Resource Unit (MLRA) 43B: Central Rocky Mountains 43B – Central Rocky Mountains – The Central Rocky Mountains extends from northern Montana to southern extent of Wyoming and from Idaho to central Wyoming. The southern extent of 43B is comprised of a combination of metamorphic, igneous, and sedimentary mountains and foothills. Climatic changes across this extent are broad and create several unique breaks in the landscape. Further information regarding MLRAs, refer to: United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. Available electronically at: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2_053624#handbook.

LRU notes

Land Resource Unit (LRU) 43B23C: Absaroka Subalpine Zone Based on the shifts in geology, precipitation patterns and other climatic factors, as well as elevation and vegetation, the Absaroka Range was divided into LRU 23. Further division of this LRU is necessary due to the gradient moving from the foothills to the summit, as well as aspect shifts (north/east face versus south/west face). Subset C is the high elevation zone noted for dense timber interspersed with open parks and longer persisting snowpack (within timberline). Precipitation can range from 18 to 20 plus inches and is more noted for the duration of snow cover and shorter growing season. To verify or identify Subset C (the referenced subset for this ecological site), refer to the Wyoming LRU matrix key contained within the Ecological Site Key. This LRU/Subset occurs on the eastern divide of the Absaroka Range. This LRU starts north of Clark, WY and runs to the Thermopolis, WY area. Once the Absaroka Range merges with the Owl Creek and Wind River Ranges, the climatic patterns and elevational changes shifts the plant community and creates a break in the LRU/Subset. The extent of soils currently correlated to this ecological site does not fit within the digitized boundary. Many of the noted soils are provisional and will be reviewed and corrected in mapping update projects. Other map units are correlated as small inclusions within other MLRA's/LRU's based on elevation, landform, and biological references. Moisture Regime: Typic Ustic Temperature Regime: Cryic Dominant Cover: Rangeland – Sagebrush Steppe (major species is Mountain Big Sagebrush) Representative Value (RV) Effective Precipitation: 20+ inches (508 mm) RV Frost-Free Days: 31-65 days

Classification relationships

Relationship to Other Established Classification Systems: National Vegetation Classification System (NVC): 2 Shrub & Herb Vegetation Class 2.B Temperate & Boreal Grassland & Shrubland Subclass 2.B.2 Temperate Grassland & Shrubland Formation 2.B.2.Na Western North American Grassland & Shrubland Division M048 Central Rocky Mountain Montane-Foothill Grassland & Shrubland Macro-group G273 Central Rocky Mountain Lower Montane, Foothill & Valley Grassland Group Ecoregions (EPA): Level I: 6 North Western Forested Mountains Level II: 6.2 Western Cordillera Level III: 6.2.10 Middle Rockies Level IV: 6.2.17ao – Absaroka Volcanic Subalpine Zone 6.2.17i – Absaroka – Gallatin Volcanic Mountains

Ecological site concept

• Site receives no additional water. • Slope is >15 but 70% (mostley 25-50%) • Soils are: o Textures range from fine sandy loam to clay loam in top 4" (10 cm) of mineral soil surface o All subsurface horizons in the particle size control section have a weighted average of >18% but 35% clay. (The particle size control section is the segment of the profile from either the start of an argillic horizon for 50 cm's or from 25-100 cm's). o Moderately deep to very deep (20-80+ in. (50-200+ cm) o > 5% stone and boulder cover and 20% cobble and gravel cover o Skeletal (?35% rock fragments) within 20" (50 cm) of mineral soil surface o Non-saline, sodic, or saline-sodic

Associated sites

R043BY162WY	**Shallow Loamy High Mountains** Shallow Loamy
R043BY172WY	**Stony High Mountains** Stony

Similar sites

R043BY172WY	**Stony High Mountains** Stony (St) 20+M has lower production and different shrub species.
R043BY108WY	**Coarse Upland High Mountains** Coarse Upland (CU) 20+M has higher production, larger coarse fragments (boulders), and different shrub species.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Cercocarpus montanus* (2) *Artemisia tridentata ssp. vaseyana*
Herbaceous	(1) *Pseudoroegneria spicata* (2) *Leucopoa kingii*

Legacy ID

R043BX770WY

Physiographic features

This site occurs on steep mountain slopes and fans.

Table 2. Representative physiographic features

Landforms	(1) Mountain range > Mountain slope (2) Mountain range > Alluvial fan (3) Mountain range > Ridge
Runoff class	Negligible to high
Elevation	1,980 – 3,660 m

Slope	20 – 70 %
Aspect	Aspect is not a significant factor

Climatic features

Annual precipitation and modeled relative effective annual precipitation range from 18 to 35 inches (457 – 889 mm). The normal precipitation pattern is evenly distributed through the year and averages over 20 inches. Annual snowfall averages 150 to 200 inches annually. Wide fluctuations may occur in yearly precipitation and result in more dry years than those with more than normal precipitation.

Because of the varied topography, the wind will vary considerably for different parts of the area. Prevailing winds are from the southwest, and strong winds are less frequent than over other areas of
Wyoming. Occasional storms, however, can bring brief periods of high winds with gusts exceeding 50
mph.

Temperatures show a wide range between summer and winter and between daily maximums and minimums, due to the high elevation and dry air, which permits rapid incoming and outgoing radiation. Cold air outbreaks from Canada in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Chinook winds may occur in winter and bring rapid rises in temperature. High winds are generally blocked by high mountains but occur in conjunction with thunderstorms, which are common in late summer. Growth of native cool-season plants begins about June 1, but can be as late as July 15, and continues until the beginning of September.

For detailed information visit the Natural Resources Conservation Service National Water and Climate Center at http://www.wcc.nrcs.usda.gov/. Climate station representative of this precipitation zone include: “Cooke City 2W” and “Tower Falls”. The following graphs and charts are a collective sample representing the averaged normals and 30-year annual rainfall data for the selected weather stations from 1981 to 2010.

Table 3 Representative climatic features

Frost-free period (characteristic range)	0-0 days
Freeze-free period (characteristic range)	20-50 days
Precipitation total (characteristic range)	460-580 mm
Frost-free period (actual range)	0-0 days
Freeze-free period (actual range)	20-50 days
Precipitation total (actual range)	430-610 mm
Frost-free period (average)	0 days
Freeze-free period (average)	40 days
Precipitation total (average)	530 mm

- (1) COOKE CITY 2 W [USC00241995], Gardiner, MT

- (2) TOWER FALLS [USC00489025], Yellowstone National Park, WY

Influencing water features

The characteristics of these upland soils have no influence from ground water (water table below 60 inches (150 cm)) and have minimal influence from surface water/overland flow. There may be isolated features that are affected by snow pack that persists longer than surrounding areas due to position on the landform (shaded/protected pockets).

Soil features

The soils of this site are moderately deep to deep (greater than 20 inches), well-drained, dark colored, and stony and/or bouldery. They occur as steep mountain foot slopes with gradients usually greater than 30%. Coarse fragments are greater than 35 percent, by volume, within the first 20 inches of soil, usually increasing with depth. Roots penetrate the soil material readily, but are forced to detour around coarse fragments.

Table 4. Representative soil features

Parent material	(1) Alluvium – igneous, metamorphic and sedimentary rock (2) Colluvium
Surface texture	(1) Gravelly, cobbly, stony loam
Family particle size	(1) Fine-loamy (2) Loamy-skeletal
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderately slow to moderately rapid
Soil depth	50 – 150 cm
Surface fragment cover <=3"	0 – 20 %
Surface fragment cover >3"	0 – 10 %
Available water capacity (0-101.6cm)	5.08 – 10.16 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 20 %
Electrical conductivity (0-101.6cm)	Not specified

Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	6.6 – 8.4
Subsurface fragment volume <=3" (Depth not specified)	10 – 30 %
Subsurface fragment volume >3" (Depth not specified)	0 – 20 %

Ecological dynamics

As this site deteriorates, species such as rhizomatous wheatgrass, mountain big sagebrush, snowberry, and rabbitbrush increase. Mountain mahogany and serviceberry as well as cool season bunchgrasses such as bluebunch wheatgrass and spike fescue will decrease in frequency and production.

The Historic Climax Plant Community (description follows the plant community diagram) has been determined by study of rangeland relic areas, or areas protected from excessive disturbance. Trends in plant communities going from heavily grazed areas to lightly grazed areas, seasonal use pastures, and historical accounts have also been used.

The following is a State and Transition Model Diagram that illustrates the common plant communities (states) that can occur on the site and the transitions between these communities. The ecological processes will be discussed in more detail in the plant community narratives following the diagram.

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				504-706	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	504-706	–
2				101-202	
3				101-202	
	spike fescue	LEKI2	*Leucopoa kingii*	101-202	–
4				101-202	
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	101-202	–
5				101-202	
	Idaho fescue	FEID	*Festuca idahoensis*	101-202	–
6				202-404	
	Grass, perennial	2GP	*Grass, perennial*	0-101	–
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	0-101	–
	western needlegrass	ACOC3	*Achnatherum occidentale*	0-101	–

	Richardson's needlegrass	ACRI8	*Achnatherum richardsonii*	0-101	–
	bentgrass	AGROS2	*Agrostis*	0-101	–
	mountain brome	BRMA4	*Bromus marginatus*	0-101	–
	California oatgrass	DACA3	*Danthonia californica*	0-101	–
	timber oatgrass	DAIN	*Danthonia intermedia*	0-101	–
	onespike danthonia	DAUN	*Danthonia unispicata*	0-101	–
	squirreltail	ELELE	*Elymus elymoides ssp. elymoides*	0-101	–
	blue wildrye	ELGL	*Elymus glaucus*	0-101	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0-101	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0-101	–
	oniongrass	MEBU	*Melica bulbosa*	0-101	–
	mountain muhly	MUMO	*Muhlenbergia montana*	0-101	–
	muttongrass	POFE	*Poa fendleriana*	0-101	–
	spike trisetum	TRSP2	*Trisetum spicatum*	0-101	–
Forb					
7				101-202	
	Forb, perennial	2FP	*Forb, perennial*	0-101	–
	common yarrow	ACMI2	*Achillea millefolium*	0-101	–
	agoseris	AGOSE	*Agoseris*	0-101	–
	pussytoes	ANTEN	*Antennaria*	0-101	–
	columbine	AQUIL	*Aquilegia*	0-101	–
	sandwort	ARENA	*Arenaria*	0-101	–
	milkvetch	ASTRA	*Astragalus*	0-101	–
	balsamroot	BALSA	*Balsamorhiza*	0-101	–
	bellflower	CAMPA	*Campanula*	0-101	–
	Indian paintbrush	CASTI2	*Castilleja*	0-101	–
	fireweed	CHAN9	*Chamerion angustifolium*	0-101	–
	hawksbeard	CREPI	*Crepis*	0-101	–
	draba	DRABA	*Draba*	0-101	–
	fleabane	ERIGE2	*Erigeron*	0-101	–
	buckwheat	ERIOG	*Eriogonum*	0-101	–
	geranium	GERAN	*Geranium*	0-101	–
	avens	GEUM	*Geum*	0-101	–
	little sunflower	HEPU3	*Helianthus pumilus*	0-101	–
	stoneseed	LITHO3	*Lithospermum*	0-101	–
	desertparsley	LOMAT	*Lomatium*	0-101	–
	lupine	LUPIN	*Lupinus*	0-101	–
	mayflower	MAIAN	*Maianthemum*	0-101	–
	creeping barberry	MARE11	*Mahonia repens*	0-101	–
	bluebells	MERTE	*Mertensia*	0-101	–
	ragwort	PACKE	*Packera*	0-101	–
	beardtongue	PENST	*Penstemon*	0-101	–
	phacelia	PHACE	*Phacelia*	0-101	–
	phlox	PHLOX	*Phlox*	0-101	–
	buttercup	RANUN	*Ranunculus*	0-101	–
	stonecrop	SEDUM	*Sedum*	0-101	–

	aster	SYMPH4	*Symphyotrichum*	0-101	–
	meadow-rue	THALI2	*Thalictrum*	0-101	–
	clover	TRIFO	*Trifolium*	0-101	–
	valerian	VALER	*Valeriana*	0-101	–
	American vetch	VIAM	*Vicia americana*	0-101	–
	violet	VIOLA	*Viola*	0-101	–
	mule-ears	WYAM	*Wyethia amplexicaulis*	0-101	–
Shrub/Vine					
8				101-303	
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	101-303	–
9				0-101	
	Saskatoon serviceberry	AMAL2	*Amelanchier alnifolia*	0-101	–
10				0-101	
	antelope bitterbrush	PUTR2	*Purshia tridentata*	0-101	–
11				101-303	
	Shrub, deciduous	2SD	*Shrub, deciduous*	0-101	–
	Shrub, evergreen	2SE	*Shrub, evergreen*	0-101	–
	Tree, deciduous	2TD	*Tree, deciduous*	0-101	–
	Tree, evergreen	2TE	*Tree, evergreen*	0-101	–
	little sagebrush	ARAR8	*Artemisia arbuscula*	0-101	–
	tarragon	ARDR4	*Artemisia dracunculus*	0-101	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0-101	–
	threetip sagebrush	ARTR4	*Artemisia tripartita*	0-101	–
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	0-101	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0-101	–
	common juniper	JUCOD	*Juniperus communis var. depressa*	0-101	–
	honeysuckle	LONIC	*Lonicera*	0-101	–
	Greene's mountain ash	SOSCS	*Sorbus scopulina var. scopulina*	0-101	–
	snowberry	SYMPH	*Symphoricarpos*	0-101	–

Table 6. Community 2.1 plant community composition

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

Table 7. Community 3.1 plant community composition

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

Animal community

Animal Community – Wildlife Interpretations Bluebunch Wheatgrass/Mountain Mahogany Plant Community (HCPC): This plant community provides excellent thermal and escape cover for wintering mule deer and elk. Year-round habitat is provided for mule deer, elk, bobcat, mountain lion, cottontail rabbits, jackrabbits, and many other birds such as the black-throated sparrow, lark sparrow, green-tailed towhee, and neo-tropical migrants. Mountain mahogany provides good thermal cover and nesting habitat for many bird species. Common Juniper/Forb Plant Community: This plant community may be useful for the same wildlife that would use the Historic Climax Plant Community. However, the plant community composition is much less diverse, and thus, less apt to meet the seasonal needs of these animals. Three-tip Sage Plant Community: This plant community exhibits a low level of plant species diversity. In most cases it is not a desirable plant community to select as a wildlife habitat management objective. Animal Community – Grazing Interpretations The following table lists suggested stocking rates for cattle under continuous season-long grazing under normal growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of the conservation planning process. Often, the current plant composition does not entirely match any particular plant community (as described in this ecological site description). Because of this, a field visit is recommended, in all cases, to document plant composition and production. More precise carrying capacity estimates should eventually be calculated using this information along with animal preference data, particularly when grazers other than cattle are

involved. Under more intensive grazing management, improved harvest efficiencies can result in an increased carrying capacity. If distribution problems occur, stocking rates must be reduced to maintain plant health and vigor. Plant Community Production Carrying Capacity* (lb./ac) (AUM/ac) Bluebunch Wheatgrass/Mountain Mahogany (HCPC) 1400-2200 0.5 Common Juniper/Forb 1000-1800 0.3 Three-tip Sage 500-1500 0.1 * - Continuous, season-long grazing by cattle under average growing conditions. Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide yearlong forage for cattle, sheep, or horses. During the dormant period, the forage for livestock use needs to be supplemented with protein because the quality does not meet minimum livestock requirements.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group B and C, with localized areas in hydrologic group D. Infiltration ranges from moderately slow to moderate. Runoff potential for this site varies from low to moderate depending on soil hydrologic group and ground cover (refer to Part 630, NRCS National Engineering Handbook for detailed hydrology information). Rills and gullies should not typically be present. Water flow patterns should be barely distinguishable if at all present. Pedestals are only slightly present in association with bunchgrasses. Litter typically falls in place, and signs of movement are not common. Chemical and physical crusts are rare to non-existent. Cryptogamic crusts are present, but only cover 1-2% of the soil surface.

Recreational uses

This site provides hunting opportunities for upland game species.

Wood products

No appreciable wood products are present on the site.

Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range trained personnel were also used. Those involved in developing this site include: Bill Christensen, Range Management Specialist, NRCS; Karen Clause, Range Management Specialist, NRCS; and Everet Bainter, Range Management Specialist, NRCS. Other sources used as references include USDA NRCS Water and Climate Center, USDA NRCS National Range and Pasture Handbook, USDI and USDA Interpreting Indicators of Rangeland Health Version 3, and USDA NRCS Soil Surveys from various counties. Information presented here has been derived from NRCS inventory data, Field observations from range trained personnel, and the existing range site descriptions. Those involved in developing the Loamy range site include: Karen Clause, Range Management Specialist, NRCS and Everet Bainter, Range Management Specialist. Those involved in the development of the new concept for Loamy and Loamy Calcareous Ecological site include: Ray Gullion, Area Range Management Specialist, NRCS; Jim Wolf, Resource Manager, USDI-BLM; Jack Mononi, Range Management Specialist, USDI-BLM; Daniel Wood, MLRA Soil Survey Leader, NRCS; Jane Karinen, Soil Data Quality Specialist, NRCS; and Marji Patz, Ecological Site Specialist, NRCS. Inventory Data References: Ocular field estimations observed by trained personnel were completed at each site. Then sites were selected where a 100-foot tape was stretched, and the following sample procedures were completed by inventory staff. For full sampling protocol and guidelines with forms please refer to the Wyoming ESI Operating Procedures, compiled in 2012 for the Powell and Rock Springs Soil Survey Office, USDA-NRCS. • Double Sampling Production Data (4.8 square foot hoop used to estimate 10 points, clipped a minimum of 2 of these estimated points, with two 21-foot X 21-foot square extended shrub plots). • Line Point Intercept (over story and understory captured with soil cover). Height of herbaceous and woody cover is collected every three feet along established transect.) • Continuous Line Intercept (Woody Canopy Cover, with minimum gap of 0.2 of a foot for all woody species and succulents. Intercept height collected at each measurement.), • Gap Intercept (Basal Gap measured with a minimum gap requirement of 0.7 foot.), • Sample Point (10 – 1-meter square point photographs taken at set distances on transect. Red using the sample point computer program established by the High Plains Agricultural Research Center, WY). • Soil Stability (Slake Test – surface and subsurface samples collected and processed according to the soil stability guidelines provided by the Jornada Research Center, NM.)

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Contributors

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Approval

Scott Woodall, 10/04/2019

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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Date	03/16/2007
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** **Rare to nonexistent. Where present, short and widely spaced.**

2. **Presence of water flow patterns:** **Barely observable.**

3. **Number and height of erosional pedestals or terracettes:** **Rare to nonexistent.**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** **Bare ground can range from 0-20%.**

5. **Number of gullies and erosion associated with gullies:** **Active gullies should not be present.**

6. **Extent of wind scoured, blowouts and/or depositional areas:** **Rare to nonexistent.**

7. **Amount of litter movement (describe size and distance expected to travel):** **Herbaceous and large woody litter not expected to move.**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** **Soil Stability Index ratings range from 3 (interspaces) to 6 (under plant canopy), but average values should be 4.0 or greater.**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil data is limited for this site. Soil OM of 6-16% is expected.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Plant community consists of 50-75% grasses, 10% forbs, and 15-40% shrubs. Evenly distributed plant canopy (60-85%) and litter plus moderate infiltration rates result in minimal runoff. Basal cover is typically greater than 10% for this site and does affect runoff on this site. Surface rock fragments of 20-50% provide stability to the site, but reduce infiltration.

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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: Mid-size, cool season bunchgrasses

    Sub-dominant: perennial shrubs perennial forbs = cool season rhizomatous grasses

    Other: short cool season bunchgrasses

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Minimal decadence, typically associated with shrub component.

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14. **Average percent litter cover (%) and depth (in):** Litter ranges from 5-30% of total canopy measurement with total litter (including beneath the plant canopy) from 50-80% expected. Herbaceous litter depth typically ranges from 3-10mm. Woody litter can be up to a couple inches (4-6 cm).

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** English: 1400-2200 lb/ac (1800 lb/ac average); Metric 1568-2464 kg/ha (2016 kg/ha average).

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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:** Bare ground greater than 35% is the most common indicator of a threshold being crossed. Rabbitbrush, Sandberg bluegrass, buckwheat, yarrow, and phlox are common increasers. Annual weeds such as cheatgrass and mustards are common invasive species in disturbed sites.

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17. **Perennial plant reproductive capability:** All species are capable of reproducing, except in extreme drought years.
