USDA Natural Resources
Conservation Service

Ecological site EX043B23C112
Gravelly (Gr) Absaroka Subalpine Zone

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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 <65%
• Soils are:
o Textures range from loamy sand to very fine sandy loam in top 4” (10 cm) of mineral soil surface
o Clay content is or = 18% 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% 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 <3% stone and boulder cover and >35% cobble and gravel cover (generally around 60%)
o Skeletal (≥35% rock fragments) within 20” (50 cm) of mineral soil surface
o Non-saline, sodic, or saline-sodic

Associated sites

R043BY122WY	**Loamy High Mountains** Loamy
R043BY130WY	**Overflow High Mountains** Overflow
R043BY162WY	**Shallow Loamy High Mountains** Shallow Loamy

Similar sites

R043BY208WY	**Coarse Upland Foothills and Mountains West** Coarse Upland (CU) 15-19W has lower production.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tripartita*
Herbaceous	(1) *Festuca idahoensis* (2) *Danthonia intermedia*

Legacy ID

R043BX712WY

Physiographic features

This site usually occurs on rolling to rough topography such as glacial moraines, but it may occur on all slopes and positions.

Table 2. Representative physiographic features

Landforms	(1) Mountain range > Hill (2) Mountain range > Alluvial fan (3) Mountain range > Ridge
Runoff class	Negligible to medium
Elevation	1,981–3,658 m
Slope	5–65%

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)	1-2 days
Freeze-free period (characteristic range)	23-47 days
Precipitation total (characteristic range)	457-584 mm
Frost-free period (actual range)	1-2 days
Freeze-free period (actual range)	17-53 days
Precipitation total (actual range)	432-610 mm
Frost-free period (average)	2 days
Freeze-free period (average)	35 days
Precipitation total (average)	533 mm

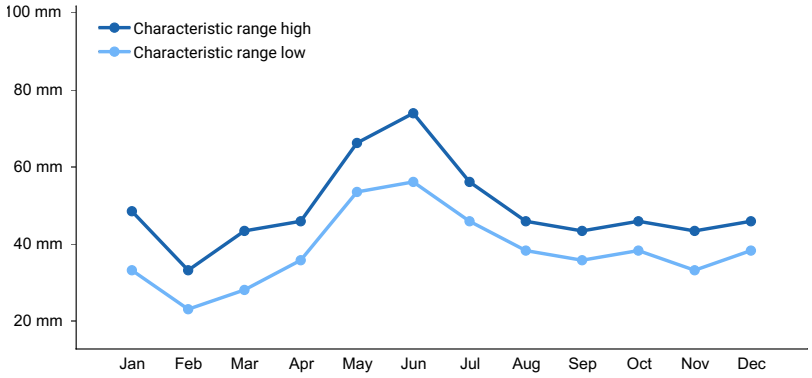


Figure 1. Monthly precipitation range

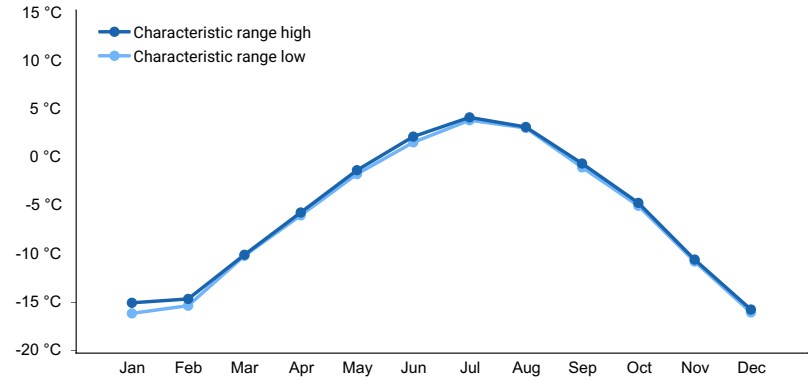


Figure 2. Monthly minimum temperature range

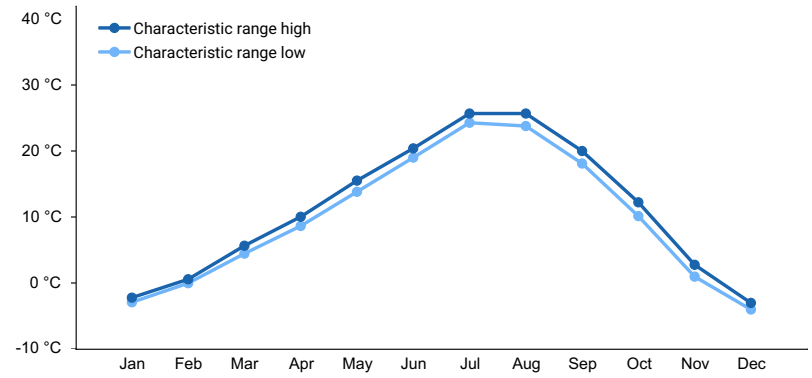


Figure 3. Monthly maximum temperature range

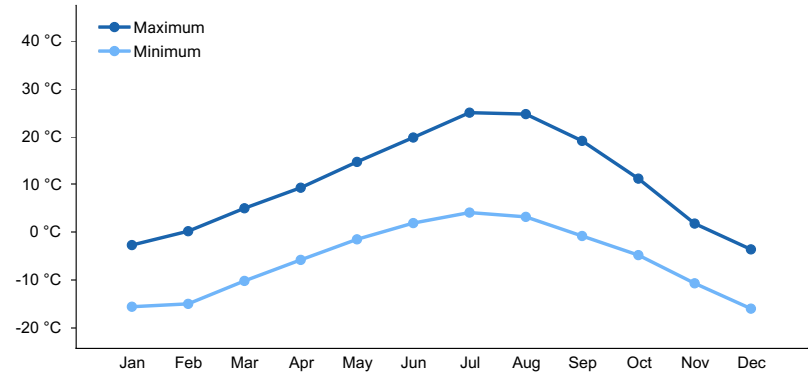


Figure 4. Monthly average minimum and maximum temperature

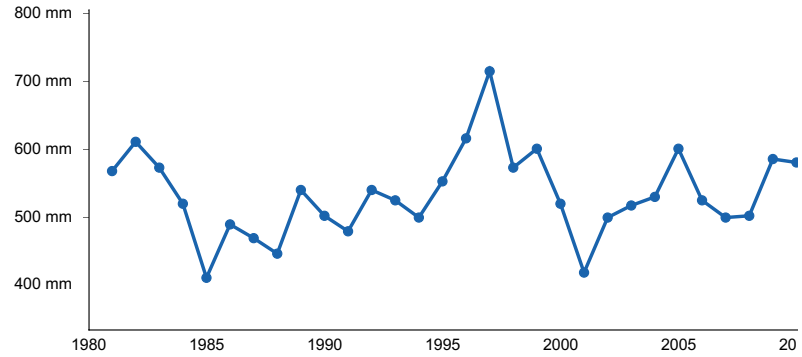


Figure 5. Annual precipitation pattern

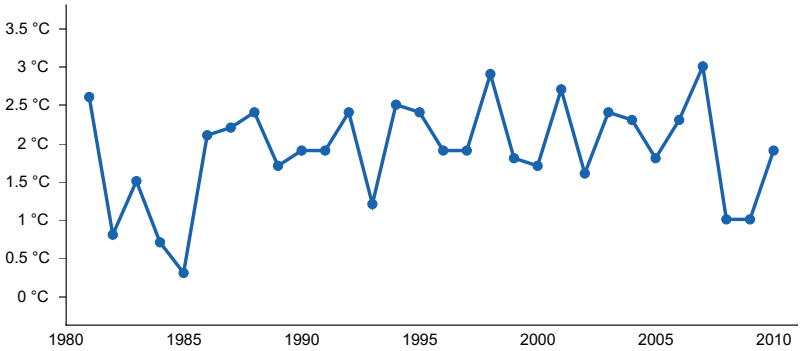


Figure 6. Annual average temperature pattern

Climate stations used

- (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 deep, well-drained and generally non-calcareous. Surface soils are usually loams or sandy loams. Soils contain a least 35 percent by volume coarse fragments in the first 20 inches. The volume of coarse fragments generally increases with depth. These stony, and/or bouldery soils occur as terraces, fan terraces, or glacial moraines.

Major Soil Series correlated to this site includes:

Table 4. Representative soil features

Parent material	(1) Alluvium–granite (2) Glaciofluvial deposits–igneous, metamorphic and sedimentary rock
Surface texture	(1) Very gravelly sandy loam (2) Cobbly fine sandy loam (3) Very cobbly loam
Family particle size	(1) Coarse-loamy (2) Loamy-skeletal
Drainage class	Well drained

Permeability class	Moderate
Soil depth	51–152 cm
Surface fragment cover <=3"	25–60%
Surface fragment cover >3"	0–30%
Available water capacity (0-101.6cm)	5.08–11.43 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.6–7.2
Subsurface fragment volume <=3" (Depth not specified)	20–50%
Subsurface fragment volume >3" (Depth not specified)	10–40%

Ecological dynamics

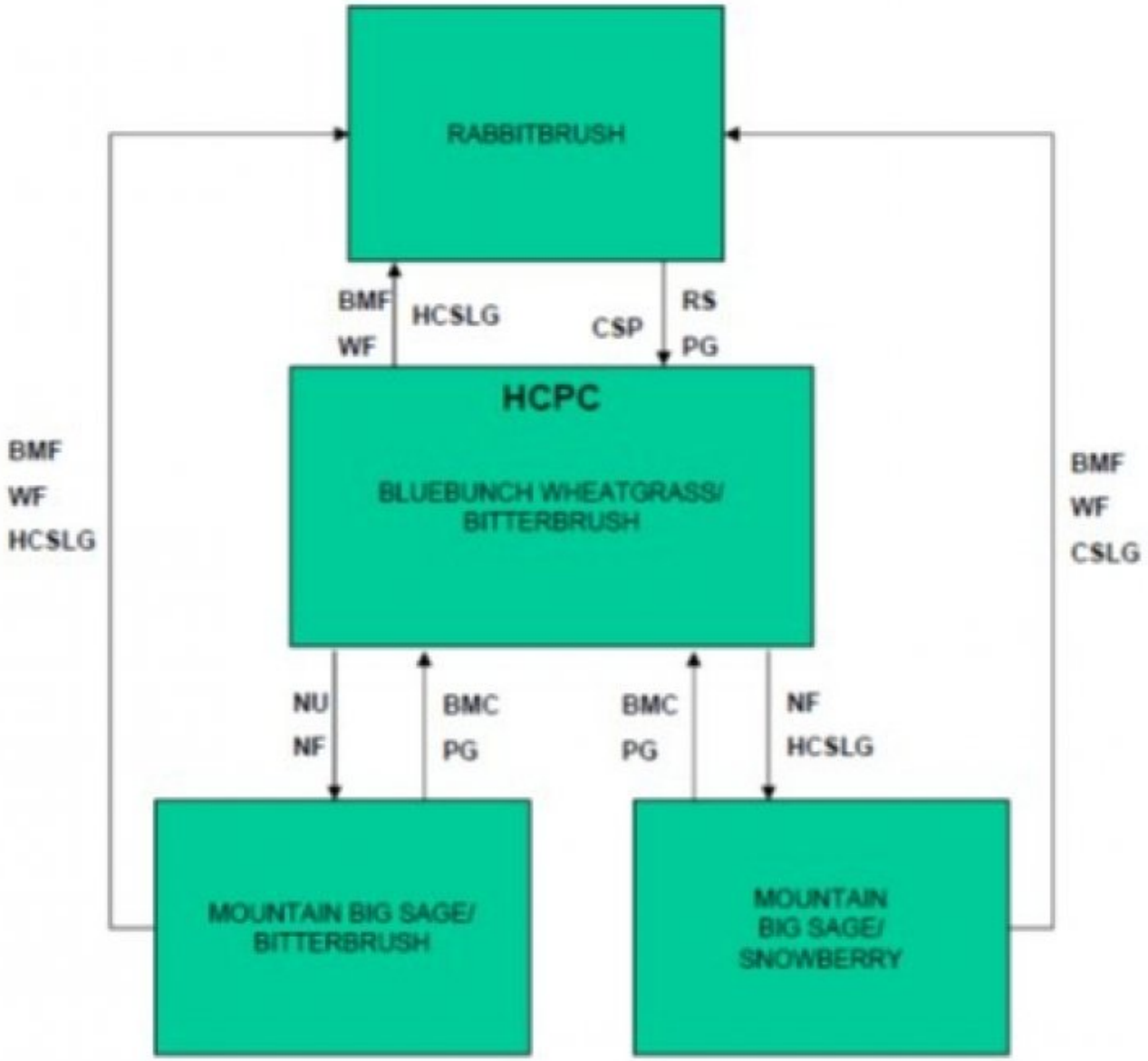
As this site deteriorates because of a combination of frequent and severe grazing, species such as rhizomatous wheatgrass, mountain big sagebrush, and snowberry will increase. Cool-season grasses such as bluebunch wheatgrass, Columbia needlegrass, spike fescue, and woody plants such as bitterbrush will decrease in frequency and production.

Mountain big sagebrush will become dominant with the absence of fire. Juniper and limber pine will often encroach on higher elevation slopes and ridges. Wildfires are often actively controlled so chemical control using herbicides has replaced the historic role of fire on this site. Recently, prescribed burning has regained some popularity.

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



BMA – Brush Management (all methods)
BMC – Brush Management (chemical)
BMF – Brush Management (fire)
BMM – Brush Management (mechanical)
CSP – Chemical Seedbed Preparation
CSLG – Continuous Season-long Grazing
DR – Drainage
CSG – Continuous Spring Grazing
HB – Heavy Browse
HCSLG – Heavy Continuous Season-long Grazing
HI – Heavy Inundation
LPG – Long-term Prescribed Grazing
MT – Mechanical Treatment (chiseling, ripping, pitting)

NF – No Fire
NS – Natural Succession
NWC – Noxious Weed Control
NWI – Noxious Weed Invasion
NU – Nonuse
P&C – Plow & Crop (including hay)
PG – Prescribed Grazing
RPT – Re-plant Trees
RS – Re-seed
SGD – Severe Ground Disturbance
SHC – Severe Hoof Compaction
WD – Wildlife Damage (Beaver)
WF - Wildfire

State 1

Bluebunch Wheatgrass/Bitterbrush Plant Community (HCPC)

Community 1.1
Bluebunch Wheatgrass/Bitterbrush Plant Community (HCPC)

The interpretive plant community for this site is the Historic Climax Plant Community. This state evolved with grazing by large herbivores and is well suited for grazing by domestic livestock. Potential vegetation is estimated at 60% grasses or grass-like plants, 15% forbs, and 25% woody plants. The major grasses include bluebunch wheatgrass, spike fescue, Idaho fescue, and big bluegrass. Other grasses may include one-spike and timber oatgrass, oniongrass, spike trisetum, Columbia, western, and Letterman needlegrass, mountain and nodding brome, slender and thickspike wheatgrass, Canby bluegrass, bentgrasses, alpine timothy, basin wildrye, prairie junegrass, and mountain muhly. Bitterbrush and mountain big sagebrush are the dominant woody plants. Other woody species may include rubber rabbitbrush, black sagebrush, snowberry, and serviceberry. A typical plant composition for this state consists of bluebunch wheatgrass 25-35%, spike fescue 10-15%, Idaho fescue 10-15%, big bluegrass 5-10%, other grasses and grass-like plants 10-20%, perennial forbs 5-15%, bitterbrush 10-20%, mountain big sagebrush 5-10%, and up to 10% other woody species. The overstory of sagebrush and understory of grass and forbs provide a diverse plant community that will support domestic livestock and wildlife such as mule deer and antelope. Ground cover, by ocular estimate, varies from 45-55% and canopy cover of shrubs ranges from 15-25%. The total annual production (air-dry weight) of this state is about 2000 lbs./acre, but it can range from about 1200 lbs./acre in unfavorable years to about 2400 lbs./acre in above average years. The following is the growth curve of this plant community expected during a normal year: Growth curve number: WY0101 Growth curve name: 20+M, UPLAND SITES Growth curve description: ALL UPLAND SITES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC 0 0 0 0 5 30 40 20 5 0 0 0 (Monthly percentages of total annual growth) This plant community is extremely stable and well adapted to the Central Rocky Mountains climatic conditions. The diversity in plant species allows for high drought tolerance. This is a sustainable plant community (site/soil stability, watershed function, and biologic integrity). Transitions or pathways leading to other plant communities are as follows: • Nonuse and No Fire will convert this plant community to the Mountain Big Sage/Bitterbrush State. • Heavy Continuous Season-long Grazing with No Fire will convert this plant community to the Mountain Big Sage/Snowberry State. • Wildfire or Prescribed Fire with Heavy Continuous Season-long Grazing will convert this plant community to the Rabbitbrush State.

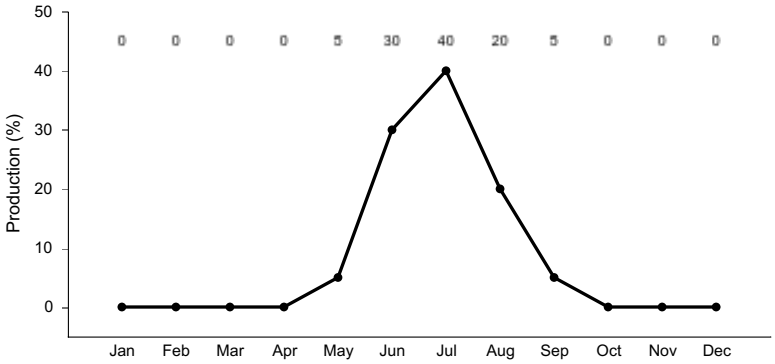


Figure 8. Plant community growth curve (percent production by month). WY0101, 20+ upland sites.

State 2
Mountain Big Sage/Bitterbrush Plant Community

Community 2.1
Mountain Big Sage/Bitterbrush Plant Community

This plant community is a result of nonuse and lack of fire. Woody plants such as big sagebrush and bitterbrush are dominant, making up 50 to 75% of the annual production. Rocky Mountain juniper and limber pine often encroach on higher elevation ridges and on north facing slopes. Woody plants may become decadent and of lower nutritive value for wildlife and livestock. Major grasses in the understory include bluebunch wheatgrass, Idaho fescue, Columbia needlegrass, and spike fescue. The total annual production (air-dry weight) of this state is about 1800 pounds per acre, but it can range from about 1000 lbs./acre in unfavorable years to about 2200 lbs./acre in above average years. The following is the growth curve of this plant community expected during a normal year: Growth

curve number: WY0101 Growth curve name: 20+M, UPLAND SITES Growth curve description: ALL UPLAND SITES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC 0 0 0 0 5 30 40 20 5 0 0 0 (Monthly percentages of total annual growth) The state is stable and protected from excessive erosion. The biotic integrity of this plant community is usually intact, however forage value will decrease and wildlife values will shift toward different species. The watershed is functioning. Transitions or pathways leading to other plant communities are as follows: • Chemical Brush Management followed by deferment for 1 to 2 years as part of a Prescribed Grazing plan will result in a plant community very similar to the Historic Climax Plant Community (Bluebunch Wheatgrass/Bitterbrush State). Care should be taken when planning brush management to consider wildlife and critical winter ranges. • Wildfire or Prescribed Fire followed by Heavy Continuous Season-long Grazing will convert this plant community to the Rabbitbrush State.

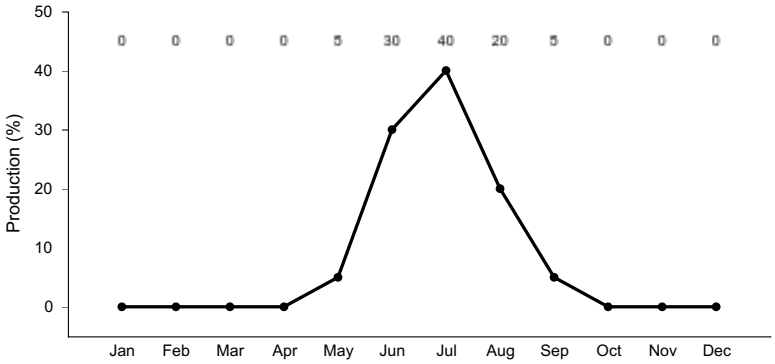


Figure 9. Plant community growth curve (percent production by month). WY0101, 20+ upland sites.

State 3
Mountain Big Sage/Snowberry Plant Community

Community 3.1
Mountain Big Sage/Snowberry Plant Community

This plant community is the result of heavy continuous season-long grazing with long-term protection from fire. Sagebrush and snowberry eventually dominate this plant community with annual production often exceeding 40%. Rocky Mountain juniper and limber pine often encroach on higher elevation ridges and on north facing slopes. Bitterbrush, although present, will be severely suppressed by sagebrush overstory and heavy browsing. Dominant grasses include rhizomatous wheatgrass, Canby and Sandberg bluegrass, and Letterman needlegrass. The total annual production (air-dry weight) of this state is about 1200 pounds per acre, but it can range from about 800 lbs./acre in unfavorable years to about 1800 lbs./acre in above average years. The following is the growth curve of this plant community expected during a normal year: Growth curve number: WY0101 Growth curve name: 20+M, UPLAND SITES Growth curve description: ALL UPLAND SITES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC 0 0 0 0 5 30 40 20 5 0 0 0 (Monthly percentages of total annual growth) Soil erosion is increased because of increased bare ground in the understory. The biotic community has been compromised, but is relatively stable. The watershed is functioning, but is at risk of further degradation. Water flow patterns and pedestals are obvious. Infiltration is reduced and runoff is increased. Transitions or pathways leading to other plant communities are as follows: • Chemical Brush Management followed by deferment for 1 to 2 years as part of a Prescribed Grazing plan will result in a plant community very similar to the Historic Climax Plant Community (Bluebunch Wheatgrass/Bitterbrush State). Care should be taken when planning brush management to consider wildlife and critical winter ranges. • Wildfire or Prescribed Fire followed by Continuous Season-long Grazing will convert this plant community to the Rabbitbrush State.

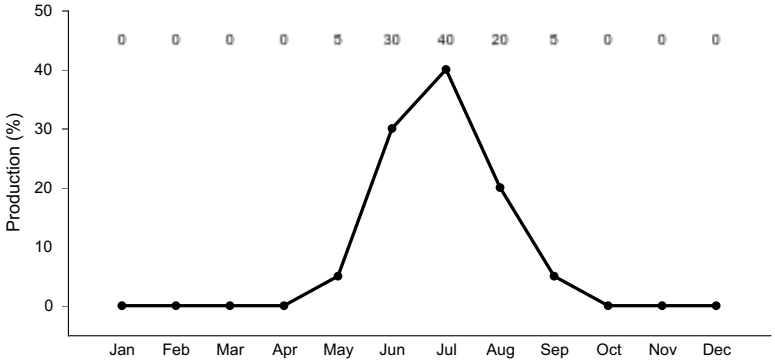


Figure 10. Plant community growth curve (percent production by month). WY0101, 20+ upland sites.

State 4
Rabbitbrush Plant Community

Community 4.1
Rabbitbrush Plant Community

This plant community is a result of wildfire or a hot prescribed fire in conjunction with unmanaged grazing practices. Bunchgrasses such as basin wildrye, bluebunch wheatgrass, Columbia needlegrass, spike fescue, and big bluegrass decrease from grazing pressure. The response of bitterbrush to fire can be quite varied, depending on the intensity of the fire. Sprouting shrubs such as rabbitbrush and spiked big sage invade these sites. The total annual production (air-dry weight) of this state is about 800 pounds per acre, but it can range from about 500 lbs./acre in unfavorable years to about 1200 lbs./acre in above average years. The following is the growth curve of this plant community expected during a normal year: Growth curve number: WY0101 Growth curve name: 20+M, UPLAND SITES Growth curve description: ALL UPLAND SITES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC 0 0 0 0 5 30 40 20 5 0 0 0 (Monthly percentages of total annual growth) The state is vulnerable to excessive erosion. The biotic integrity of this plant community is at risk depending on how far a shift has occurred in plant composition toward rabbitbrush and annual forbs. The watershed is at risk as bare ground increases. Transitions or pathways leading to other plant communities are as follows: • Chemical Seedbed Preparation and Re-seeding followed by deferment for 1 to 2 years as part of a Prescribed Grazing plan will result in a plant community very similar to the Historic Climax Plant Community (Bunchgrass/Bitterbrush State). Additional deferment may be necessary and should be prescribed on an individual site basis.

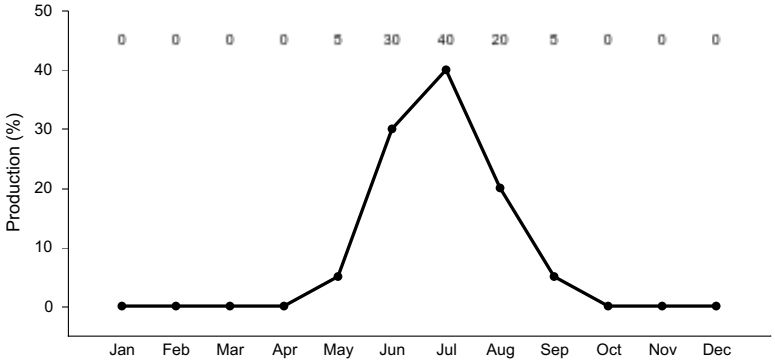


Figure 11. Plant community growth curve (percent production by month). WY0101, 20+ upland sites.

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1				560–785	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	560–785	–

2				224–336	
	Idaho fescue	FEID	*Festuca idahoensis*	224–336	–
3				224–336	
	spike fescue	LEKI2	*Leucopoa kingii*	224–336	–
4				112–224	
5				224–448	
	Grass, perennial	2GP	*Grass, perennial*	0–112	–
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	0–112	–
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	0–112	–
	western needlegrass	ACOC3	*Achnatherum occidentale*	0–112	–
	bentgrass	AGROS2	*Agrostis*	0–112	–
	mountain brome	BRMA4	*Bromus marginatus*	0–112	–
	Porter brome	BRPO2	*Bromus porteri*	0–112	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	0–112	–
	California oatgrass	DACA3	*Danthonia californica*	0–112	–
	timber oatgrass	DAIN	*Danthonia intermedia*	0–112	–
	onespike danthonia	DAUN	*Danthonia unispicata*	0–112	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–112	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–112	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–112	–
	basin wildrye	LECI4	*Leymus cinereus*	0–112	–
	oniongrass	MEBU	*Melica bulbosa*	0–112	–
	mountain muhly	MUMO	*Muhlenbergia montana*	0–112	–
	alpine timothy	PHAL2	*Phleum alpinum*	0–112	–
	spike trisetum	TRSP2	*Trisetum spicatum*	0–112	–
Forb					
6				112–336	
	Forb, perennial	2FP	*Forb, perennial*	0–112	–
	common yarrow	ACMI2	*Achillea millefolium*	0–112	–
	giant hyssop	AGAST	*Agastache*	0–112	–
	agoseris	AGOSE	*Agoseris*	0–112	–
	pussytoes	ANTEN	*Antennaria*	0–112	–
	sandwort	ARENA	*Arenaria*	0–112	–
	milkvetch	ASTRA	*Astragalus*	0–112	–
	balsamroot	BALSA	*Balsamorhiza*	0–112	–
	Indian paintbrush	CASTI2	*Castilleja*	0–112	–
	pale bastard toadflax	COUMP	*Comandra umbellata ssp. pallida*	0–112	–
	hawksbeard	CREPI	*Crepis*	0–112	–
	cryptantha	CRYPT	*Cryptantha*	0–112	–
	draba	DRABA	*Draba*	0–112	–
	fleabane	ERIGE2	*Erigeron*	0–112	–
	buckwheat	ERIOG	*Eriogonum*	0–112	–

	aster	EUCEP2	*Eucephalus*	0–112	–
	avens	GEUM	*Geum*	0–112	–
	sunflower	HELIA3	*Helianthus*	0–112	–
	pea	LATHY	*Lathyrus*	0–112	–
	desertparsley	LOMAT	*Lomatium*	0–112	–
	lupine	LUPIN	*Lupinus*	0–112	–
	creeping barberry	MARE11	*Mahonia repens*	0–112	–
	bluebells	MERTE	*Mertensia*	0–112	–
	ragwort	PACKE	*Packera*	0–112	–
	beardtongue	PENST	*Penstemon*	0–112	–
	phacelia	PHACE	*Phacelia*	0–112	–
	phlox	PHLOX	*Phlox*	0–112	–
	American bistort	POBI6	*Polygonum bistortoides*	0–112	–
	primrose	PRIMU	*Primula*	0–112	–
	buttercup	RANUN	*Ranunculus*	0–112	–
	stonecrop	SEDUM	*Sedum*	0–112	–
	goldenrod	SOLID	*Solidago*	0–112	–
	clover	TRIFO	*Trifolium*	0–112	–
	American vetch	VIAM	*Vicia americana*	0–112	–
	mule-ears	WYAM	*Wyethia amplexicaulis*	0–112	–
Shrub/Vine					
7				224–448	
	antelope bitterbrush	PUTR2	*Purshia tridentata*	224–448	–
8				112–224	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	112–224	–
9				0–224	
	Shrub, deciduous	2SD	*Shrub, deciduous*	0–112	–
	Shrub, evergreen	2SE	*Shrub, evergreen*	0–112	–
	Tree, deciduous	2TD	*Tree, deciduous*	0–112	–
	Tree, evergreen	2TE	*Tree, evergreen*	0–112	–
	Saskatoon serviceberry	AMAL2	*Amelanchier alnifolia*	0–112	–
	tarragon	ARDR4	*Artemisia dracunculus*	0–112	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–112	–
	black sagebrush	ARNO4	*Artemisia nova*	0–112	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–112	–
	snowberry	SYMPH	*Symphoricarpos*	0–112	–

Animal community

Animal Community – Wildlife Interpretations

Bluebunch Wheatgrass/Bitterbrush Plant Community (HCPC): This plant community provides suitable thermal and escape cover for mule deer, elk, and antelope. Bitterbrush and sagebrush provide important winter forage for mule deer and elk. Birds that would frequent this plant community include horned larks and golden eagles.

Mountain Big Sage/Bitterbrush Plant Community: This plant community may be beneficial for the same wildlife that would use the Historic Climax Plant Community. However, the plant community composition is less diverse, and thus, less apt to meet the seasonal needs of these animals.

Mountain Big Sage/Snowberry Plant Community: This plant community may be beneficial for the same wildlife that would use the Historic Climax Plant Community. However, the plant community composition is less diverse, and thus, less apt to meet the seasonal needs of these animals. Bitterbrush suppression affects the quality and quantity of winter forage for mule deer and elk.

Rabbitbrush Plant Community: This plant community provides spring forage and limited cover for elk and mule deer due to lack of palatable woody species.

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 (lb./ac)	Carrying Capacity* (AUM/ac)
Bluebunch Wheatgrass/Bitterbrush	1200-2400	0.6
Mountain Big Sage/Bitterbrush	1000-2200	0.5
Mountain Big Sage/Snowberry	800-1800	0.3
Rabbitbrush	500-1200	0.2

* - 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 A and B. Infiltration ranges from rapid to moderate. Runoff potential for this site varies from low to moderate depending on soil hydrologic group and ground cover. In many cases, areas with greater than 75% ground cover have the greatest potential for high infiltration and lower runoff. Areas where ground cover is less than 50% have the greatest potential to have reduced infiltration and higher runoff (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. The wide variety of plants which bloom from spring until fall have an esthetic value that appeals to visitors. The varied topography and large boulders appeal to hikers and mountain bikers.

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.

Author(s)/participant(s)	K. Clause, E. Bainter
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Date	03/16/2007
Approved by	E. Bainter
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.

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

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

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground can range from 0-15%.

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

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

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7. **Amount of litter movement (describe size and distance expected to travel):** Herbaceous and large woody litter not expected 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):** Soil Stability Index ratings range from 3 (interspaces) to 6 (under plant canopy), but average values should be 4.0 or greater.

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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 45-65% grasses, 15% forbs, and 20-40% shrubs. Evenly distributed plant canopy (60-95%) 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 5-20% 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>>

    Other: perennial forbs>tall, cool season bunchgrasses=cool season rhizomatous grasses=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 5-40% of total canopy measurement with total litter (including beneath the plant canopy) from 50-90% expected. Herbaceous litter depth typically ranges from 5-15mm. 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: 1200-2400 lb/ac (2000 lb/ac average); Metric 1344-2688 kg/ha (2240 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 25% is the most common indicator of a threshold being crossed. Rabbitbrush, Sandberg bluegrass, buckwheat, phlox, and yarrow are common increasers. Kentucky bluegrass, common dandelion, thistles, and 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.
