Ecological site EX043B23B162
Shallow Loamy (SwLy) Absaroka Upper Foothills

Last updated: 4/30/2024
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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.

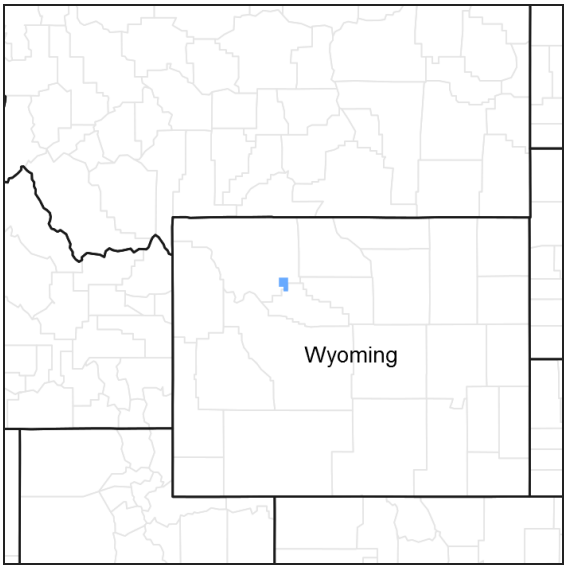


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

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) 43B23B: Absaroka Upper Foothills

Based on the shifts in geology, precipitation patterns and other climatic factors, as well as elevations 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 B is set for the higher elevations within the foothills, with 15 to 19 inches of precipitation. To verify or identify Subset B (the referenced subset for this ecological site), refer to the Wyoming LRU matrix key contained within the Ecological Site Key.

This particular LRU/Subset occurs along the eastern foothills of the Absaroka Range. This LRU starts north of Clark, WY and runs to the Thermopolis, WY area. Once the foothills cross into the Northern Beartooth Range, the climatic patterns and elevational changes shifts the plant community and allows for a break in LRU's near the Montana state line. As the LRU follows to the south and then tracks east to the intersection of the Absaroka Range and the Owl Creek Range, the face changes aspect and geology creating a shift in plant dynamics and a break in the LRU.

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: Frigid
Dominant Cover: Rangeland – Sagebrush Steppe (major species is Mountain Big Sagebrush)
Representative Value (RV) Effective Precipitation: 15-19 inches (381 – 483 mm)
RV Frost-Free Days: 37 - 80 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 Division
M048 Central Rocky Mountain Montane-Foothill Grassland & Shrubland Macrogroup
G273 Central Rocky Mountain Lower Montane, Foothill & Valley Grassland Group

Ecoregions (EPA):
Level I: 10 North American Deserts Level II: 10.1 Cold Deserts
Level III: 10.1.18 Wyoming Basin
Level IV: 10.1.18.b Big Horn Basin and
10.1.18.d Foothills and Low Mountains

Ecological site concept

• Site receives no additional water.
• Slope is < 50%
• Soils are:
o Textures range from very fine sandy loam to clay loam in top 4" (10 cm) of mineral soil surface
o All subsurface horizons have a weighted average of >18% clay but < 35% clay.
o Shallow (10-20 in. (25-50 cm)
o < 10% stone and boulder cover and < 10% cobble and gravel cover
o Not skeletal (<35% rock fragments) within 20" (50 cm) of mineral soil surface
o Non-saline, sodic, or saline-sodic
o Soil derived from sedimentary parent material (i.e. sandstone or shale bedrock)

Associated sites

EX043B23B112	**Gravelly (Gr) Absaroka Upper Foothills** Gravelly sites will occur on exposed shoulders and then down slope or inward on the landform Shallow Loamy sites are common.
EX043B23B122	**Loamy (Ly) Absaroka Upper Foothills** Loamy sites will be found down slope or on lower landscape positions on the same inter-bedded sedimentary bedrock or sandstone. Loamy sites will also occur on the dip slopes and ridges of escarpments formed by these same bedrock materials
EX043B23B166	**Shallow Sandy (SwSy) Absaroka Upper Foothills** Shallow Sandy sites occur in association with Shallow Loamy sites on the outcropping of inter-bedded sedimentary parent material and sandstone. They will also occur on the dip slopes and ridges of escarpments formed by these same parent materials.

Similar sites

DX032X01B162	**Shallow Loamy (SwLy) Big Horn Basin Rim** Shallow Loamy (SwLy) Big Horn Basin Rim is a mesic site classified using similar ecological site characteristics and falls within the 10-14" precipitation range. The plant diversity differs slightly and the annual production is lower.
EX043B23A162	**Shallow Loamy (SwLy) Absaroka Lower Foothills** Shallow Loamy (SwLy) Absaroka Lower Foothills is a frigid site classified using similar ecological site characteristics and falls within the 10-14" precipitation range. The plant diversity differs slightly and the annual production is lower.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata ssp. vaseyana*
Herbaceous	(1) *Achnatherum nelsonii* (2) *Leucopoa kingii*

Legacy ID

R043BX662WY

Physiographic features

Shallow Loamy Ecological Sites occur on steep slopes ranging up to 45 percent. Ridge tops, escarpments and hillsides are the major landforms where this site is found. This site generally comprises a small soils component mapped on these landforms. Soil deposition is minimal on steep slopes and the soils are less developed and shallow to bedrock. The geology and inherent soil chemistry is complex in the Northern Intermountain Desertic Basins. The Shallow Loamy Ecological Site lacks influence from saline or sodic soils which is a key factor to categorize it separately from other shallow sites.

There is no indication of a water table within 60 inches (150 cm) at any point throughout the calendar year. No additional overland flow of precipitation or moisture influences this site. This site also is characterized by no additional moisture capture.

Table 2. Representative physiographic features

Landforms	(1) Foothills > Hill (2) Foothills > Alluvial fan (3) Foothills > Ridge (4) Foothills > Stream terrace
Runoff class	Negligible to high
Elevation	1,829–2,743 m
Slope	20–50%

Aspect	Aspect is not a significant factor

Climatic features

Annual precipitation and modeled relative effective annual precipitation ranges from 15 to 19 inches (381 to 483 mm). The normal precipitation pattern shows peaks in June tapering into September. This amounts to about 50 percent of the mean annual precipitation. Average snowfall is about 150 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. The wind is usually much lighter at the lower elevations and in the valleys as compared with the higher terrain. The average winter wind velocity is 8.5 mph while the summer wind velocity averages 7.5 mph. Winds during storms and on ridges may exceed 45 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 May 1 to May 15 and continues until about October 15.

For detailed information visit the Natural Resources Conservation Service National Water and Climate Center at http://www.wcc.nrcs.usda.gov/. Historically, “Crandall Creek" was the representative weather stations within this subset. However, "Sunshine 3NE" is the only available weather station within a close proximity in location and characteristics for this subset. 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)	37-80 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	381-483 mm
Frost-free period (actual range)	37-80 days
Freeze-free period (actual range)	84 days
Precipitation total (actual range)	356-483 mm
Frost-free period (average)	40 days
Freeze-free period (average)	84 days
Precipitation total (average)	381 mm

Climate stations used

- (1) SUNSHINE 3NE [USC00488758], Meeteetse, 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).

Wetland description

No wetlands associated.

Soil features

The soils of this site are shallow (less than 20 inches to bedrock) well-drained soils formed in alluvium over residuum or in residuum. These soils have moderately slow to moderate permeability and may occur on all slopes. The bedrock may be any kind except igneous, which is virtually impenetrable to plant roots. The soil characteristic having the most influence on the plant community is the shallow depth.

Table 4. Representative soil features

Parent material	(1) Alluvium–limestone, sandstone, and shale (2) Residuum
Surface texture	(1) Loam (2) Silt loam (3) Clay loam (4) Very fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Depth to restrictive layer	25–51 cm
Soil depth	25–51 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–20%
Available water capacity (0-101.6cm)	2.79–10.67 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–5
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–15%

Ecological dynamics

Potential vegetation on this site is dominated by mid cool-season perennial grasses. Other significant vegetation includes black and mountain big sagebrush, antelope bitterbrush and a variety of forbs. On areas along the west slopes of the Big Horn Mountains, mountain mahogany is the significant shrub. The expected potential composition for this site is about 75% grasses, 10% forbs and 15% woody plants. The composition and production will vary naturally due to historical use, fluctuating precipitation and fire frequency.

As this site deteriorates, species such as bluegrasses, rhizomatous wheatgrasses and black and mountain big sagebrush will increase. Cool season grasses such as Columbia needlegrass, spike fescue, bluebunch wheatgrass, and Idaho fescue will decrease in frequency and production. As conditions continue to deteriorate annuals such as cheatgrass will invade.

Mountain big sagebrush may become dominant on areas with an absence of fire. Wildfires are actively controlled in recent times and as a result old decadent stands of mountain big sagebrush persist. Chemical and mechanical controls have replaced the historic role of fire on this site. Recently, prescribed burning has regained some popularity.

The mountain big sagebrush component may not be as resilient once it has been removed or severely reduced, if a

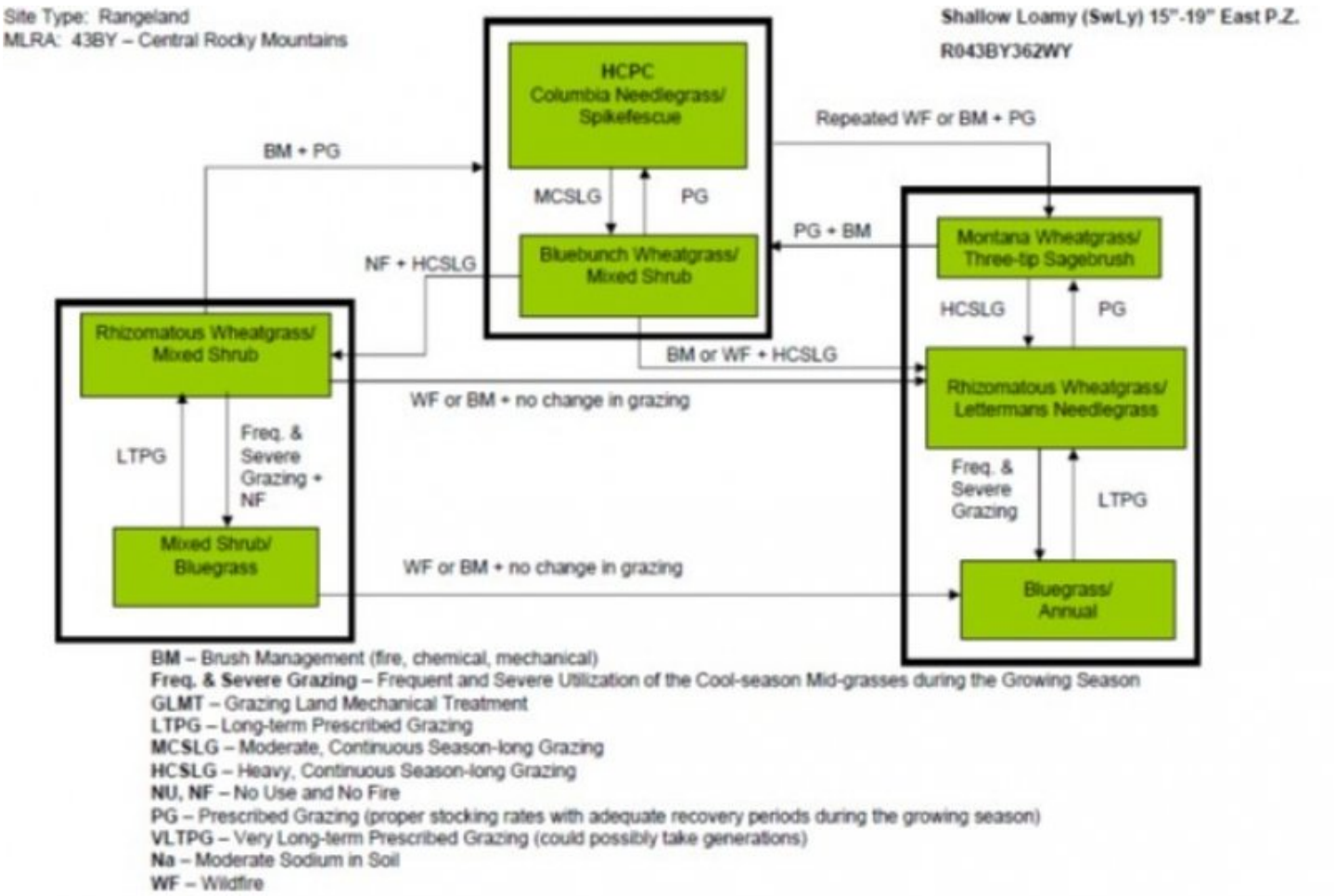
vigorous stand of grass exists and is maintained. The exception to this is where the herbaceous component is severely degraded at the time of treatment, growing conditions are unfavorable after treatment, and/or recovery of herbaceous species are inadequate due to poor grazing management. Regeneration of big sagebrush may also be suppressed if three-tip sagebrush and rubber rabbitbrush is established. This situation is more likely to develop in areas where fires have occurred in a relatively short cycle. Three-tip sagebrush and rubber rabbitbrush are strong resprouters and will out compete other shrubs where a site is disturbed. Any thinning project should be designed in a way to maintain the viability of the stand and to consider wildlife requirements.

The Reference State (State 1) 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.

Following are the narratives for each of the described plant communities. These plant communities may not represent every possibility, but they probably are the most prevalent and repeatable plant communities. The plant composition tables shown above have been developed from the best available knowledge at the time of this revision. As more data is collected, some of these plant communities may be revised or removed, and new ones may be added. None of these plant communities should necessarily be thought of as “Desired Plant Communities”. According to the USDA NRCS National Range and Pasture Handbook, Desired Plant Communities (DPC’s) will be determined by the decision-makers and will meet minimum quality criteria established by the NRCS. The main purpose for including any description of a plant community here is to capture the current knowledge and experience at the time of this revision.

State and transition model



State 1
Reference State

The Reference State (State 1) for the Shallow Loamy Ecological Site is dominated by mid-stature, cool-season bunchgrasses and fescues. This state persisted under grazing by large ungulates and was a resource for forage and habitat for a variety of wildlife. The Reference State (State 1) 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.

Characteristics and indicators. The Reference State (State 1) is characterized by the prominent cover of bluebunch wheatgrass and Idaho fescue (20-50 percent composition). Columbia needlegrass (10-25 percent composition) and spike fescue (10-25 percent composition) also make up a significant portion of foliar cover. Shrubs such as mountain big sagebrush is primarily a minor component (5-20 percent composition) but will increase as the plant community moves away from Reference State conditions.

Resilience management. The state is stable and well adapted to the Central Rocky Mountains climate. The diversity in plant species provides resistance to influence from drought, non-native species, etc. This is a sustainable plant community (site/soil stability, watershed function, and biologic integrity).

Dominant plant species

- Columbia needlegrass (*Achnatherum nelsonii*), grass
- Letterman's needlegrass (*Achnatherum lettermanii*), grass
- spike fescue (*Leucopoa kingii*), grass
- bluebunch wheatgrass (*Pseudoroegneria spicata*), grass

Community 1.1
Columbia needlegrass/Spike fescue Plant Community

The interpretive plant community for this site is the Reference Plant Community. This state evolved with grazing by large herbivores and periodic fires. Potential vegetation is about 75% grasses or grass-like plants, 10% forbs, and 15% woody plants. The cyclical nature of the fire regime in this community prevents mountain big sagebrush from being the dominant landscape. This plant community can be found on areas that are properly managed with grazing and/or prescribed burning, and on areas receiving periods of rest. Cool season midgrasses dominate the state. The major grasses include Columbia needlegrass, spike fescue, Idaho fescue, and bluebunch wheatgrass. Mountain big and black sagebrush are conspicuous element of this state, occurring in a mosaic pattern, and makes up 5 to 10% of the annual production. On areas along the west slope of the Big Horn Mountains, curl-leaf mountain mahogany is the dominant shrub. A variety of forbs also occurs in this state and plant diversity is high (see Plant Composition Table). The total annual production (air-dry weight) of this state is about 850 pounds per acre, but it can range from about 500 lbs./acre in unfavorable years to about 1000 lbs./acre in above average years. Transitions or pathways leading to other plant communities are as follows: • Moderate, continuous season-long grazing will convert the plant community to the Bluebunch Wheatgrass/Mixed Shrub Plant Community. • Repeated Wild Fire or Brush Management + Prescribed Grazing will convert the Reference Plant Community to the Montana Wheatgrass/Three-tip Sagebrush/Plant Community.

Resilience management. 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).

Dominant plant species

- Columbia needlegrass (*Achnatherum nelsonii*), grass
- spike fescue (*Leucopoa kingii*), grass
- Idaho fescue (*Festuca idahoensis*), grass
- bluebunch wheatgrass (*Pseudoroegneria spicata*), grass

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	420	717	841
Shrub/Vine	84	140	168
Forb	56	95	112
Total	**560**	**952**	**1121**

Figure 9. Plant community growth curve (percent production by month). WY0601, 15-19E all upland sites.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			5	15	40	20	10	10			

Community 1.2
Bluebunch Wheatgrass/Mixed Shrub Plant Community

Historically, this plant community evolved under grazing by large ungulates and a low fire frequency. Currently, this site is normally found under a moderate, season-long grazing regime and will be exacerbated by prolonged drought conditions. In addition, the fire regime for this site has been modified and extended periods without fire is now common. Shrubs are important components of this plant community. Cool-season grasses make up the majority of the understory with the balance made up of miscellaneous forbs. Dominant grasses include bluebunch wheatgrass, Idaho fescue, rhizomatous wheatgrass, prairie Junegrass, and of less frequency Columbia needlegrass and spike fescue. Grasses of secondary importance include Letterman's needlegrass, slender wheatgrass, bluegrasses, needle and thread, and spike trisetum. Forbs commonly found in this plant community include asters, phlox, buckwheat, pussytoes, lupine, paintbrush, agoseris, and larkspurs. Sagebrushes and antelope bitterbrush make up from 15% to 20% of the total annual production. On areas along the west slope of the Big Horn Mountains, curl-leaf mountain mahogany is the dominant shrub on this site and comprises 15% to 20% of the total annual production. When compared to the Reference Plant Community (1.1), mountain big and black sagebrushes or mountain mahogany, rhizomatous wheatgrasses, and bluegrasses have increased. Columbia needlegrass and spike fescue have decreased, often occurring only where protected from grazing by the sagebrush canopy. Some weedy species such as cheatgrass may have invaded the site but are in small patches. The total annual production (air-dry weight) of this state is about 800 pounds per acre, but it can range from about 450 lbs./acre in unfavorable years to about 950 lbs./acre in above average years. Transitions or pathways leading to other plant communities are as follows: • Prescribed grazing will convert this plant community to the Reference Plant Community (1.1). The probability of this occurring is high especially if rotational grazing along with short deferred grazing is implemented as part of the prescribed method of use. In addition, the removal of fire suppression will allow a somewhat natural fire regime to reoccur to more easily transition between this plant community and the Reference Plant Community (1.1). A prescribed fire treatment can be useful to hasten this transition if desired. • Heavy, continuous, season-long grazing plus no fires will convert the plant community to the Rhizomatous Wheatgrass/Mixed Shrub Plant Community. The probability of this occurring is high. This is especially evident on areas where drought or heavy browsing does not adversely impact the shrub stand. • Heavy, continuous, season-long grazing plus wildfire or brush management will convert the plant community to a Rhizomatous Wheatgrass/Letterman's Needlegrass Plant Community. The probability for this is high, especially on areas were the shrubs have been heavily browsed or removed by natural or human causes. Drought can also exacerbate this transition. • Repeated Wild Fire or Brush Management + Prescribed Grazing will convert the Reference State (State 1) to the Montana Wheatgrass/Three-tip Sagebrush/ Plant Community.

Resilience management. This plant community is resistant to change. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. The herbaceous component is mostly intact and plant vigor and replacement capabilities are sufficient. Water flow patterns and litter movement may be occurring but only on steeper slopes. Incidence of pedestalling is minimal. Soils are mostly stable and the surface shows minimum soil loss. The watershed is functioning and the biotic community is intact.

Dominant plant species

- mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*), shrub
- antelope bitterbrush (*Purshia tridentata*), shrub

- bluebunch wheatgrass (*Pseudoroegneria spicata*), grass
- Idaho fescue (*Festuca idahoensis*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- prairie Junegrass (*Koeleria macrantha*), grass

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	353	628	745
Shrub/Vine	101	179	213
Forb	50	90	106
Total	**504**	**897**	**1064**

Pathway CP 1.1-1.2
Community 1.1 to 1.2

Moderate, Continuous Season-Long Grazing • Moderate, continuous season-long grazing will convert the plant community to the Bluebunch Wheatgrass/Mixed Shrub Plant Community (1.2).

Pathway CP 1.2-1.1
Community 1.2 to 1.1

Prescribed Grazing • Prescribed grazing will convert this plant community to the Reference Plant Community (1.1). The probability of this occurring is high especially if rotational grazing along with short deferred grazing is implemented as part of the prescribed method of use. In addition, the removal of fire suppression will allow a somewhat natural fire regime to reoccur to more easily transition between this plant community and the Reference Plant Community (1.1). A prescribed fire treatment can be useful to hasten this transition if desired.

State 2
Perennial Grasses/Mixed Shrub

The Perennial Grasses/Mixed Shrub State of the Shallow Loamy Ecological Site is dominated by shrubs as a result of extensive grazing and lack of fire. Preferred cool season grasses have been reduced. A mixed of shrubs account for >20 percent of plant composition.

Characteristics and indicators. The Perennial Grasses/Mixed Shrub State is characterized by the prominent cover of perennial grasses (40-80 percent composition) and greater than 20 percent composition by a variety of shrubs.

Resilience management. The state is resistant to change and may become more fire resistant as fine fuels are reduced by continued frequent and severe grazing.

Dominant plant species

- curl-leaf mountain mahogany (*Cercocarpus ledifolius*), shrub
- mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*), shrub
- antelope bitterbrush (*Purshia tridentata*), shrub
- Montana wheatgrass (*Elymus albicans*), grass
- Letterman's needlegrass (*Achnatherum lettermanii*), grass
- prairie Junegrass (*Koeleria macrantha*), grass
- Sandberg bluegrass (*Poa secunda*), grass

Community 2.1
Rhizomatous Wheatgrass/Mixed Shrub Plant Community

This plant community currently is found under heavy continuous season-long grazing by livestock and protection

from fire. Shrubs are a significant component of this plant community. Cool-season grasses make up the majority of the understory, but some of the preferred grasses have been reduced or are absent. Dominant grasses include rhizomatous wheatgrass, Lettermans needlegrass, prairie Junegrass, bluegrasses and of less frequency Columbia needlegrass, spike fescue, Idaho fescue and bluebunch wheatgrass. Grasses of secondary importance include slender wheatgrass, spike trisetum, Indian ricegrass, needle and thread, one-spike oatgrass, and upland sedge. Forbs commonly found in this plant community include argosies, biscuitroot, groundsel, buckwheat, phlox, lupine, larkspur, stonecrop, pussytoes, and American vetch. Black and mountain big sagebrushes and antelope bitterbrush can make up to 30% of the total annual production. On areas along the west slope of the Big Horn Mountains, curl-leaf mountain mahogany replaces black sagebrush as the dominant shrub on this site. When compared to the Reference State (State 1), black sagebrush or curl-leaf mountain mahogany, mountain big sagebrush, bluegrasses, prairie Junegrass, and rhizomatous wheatgrasses have increased. Most of the preferred grasses and antelope bitterbrush have been reduced and some are absent. Some annuals, such as cheatgrass, have invaded the site, but are not yet abundant. The total annual production (air-dry weight) of this state is about 650 pounds per acre, but it can range from about 400 lbs./acre in unfavorable years to about 800 lbs./acre in above average years. Transitions or pathways leading to other plant communities are as follows: • Prescribed grazing plus brush management will convert this plant community to near Reference Plant Community (1.1). If prescribed fire is used as a means to reduce or remove the shrubs, sufficient fine fuels will need to be present. This may require deferment from grazing prior to treatment. Post management is critical to ensure success. This can range from two or more years of rest to partial growing season deferment, depending on the condition of the understory at the time of treatment and the growing conditions following treatment. Seeding will be required regardless of the brush treatment to reestablish the major cool-season grasses. • Frequent and Severe Grazing plus no fires will convert the plant community to the Mixed Shrub/Bluegrass Plant Community. The probability of this occurring is high and is especially evident on areas where drought or heavy browsing does not adversely impact the shrub stand. • Brush management or Wildfire with no change in grazing management will convert this plant community to the Rhizomatous Wheatgrass/Lettermans Needlegrass Plant Community.

Resilience management. This plant community is resistant to change as the shrubs become more abundant. These areas may actually be more resistant to fire as less fine fuels are available and the bare ground between the shrubs is increased. The herbaceous component is not as diverse and plant vigor and species regeneration capabilities of some cool-season perennials are deficient. The removal of grazing does not seem to affect the plant composition or structure of the plant community. Soil erosion is accelerated because of increased bare ground. Water flow patterns and pedestalling is more noticeable. Infiltration is reduced and runoff is increased. Rill channels may be noticeable in the interspaces on steeper areas and gullies may be establishing where rills have concentrated down slope.

Dominant plant species

- mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*), shrub
- antelope bitterbrush (*Purshia tridentata*), shrub
- western wheatgrass (*Pascopyrum smithii*), grass
- Letterman's needlegrass (*Achnatherum lettermanii*), grass
- prairie Junegrass (*Koeleria macrantha*), grass
- bluebunch wheatgrass (*Pseudoroegneria spicata*), grass

Dominant resource concerns

- Sheet and rill erosion
- Ephemeral gully erosion
- Classic gully erosion

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	269	437	538
Shrub/Vine	135	219	269
Forb	45	73	90
Total	**449**	**729**	**897**

Figure 12. Plant community growth curve (percent production by month). WY0601, 15-19E all upland sites.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			5	15	40	20	10	10			

Community 2.2
Mixed Shrub/Bluegrass

This plant community is the result of frequent and severe grazing and protection from fire. Mountain big sagebrush is the dominant shrub of this plant community as the annual production of shrubs exceeds 30%. Mountain big sagebrush is a significant component of the plant community and the preferred cool season grasses have been eliminated or greatly reduced. The interspaces between plants have expanded leaving the amount of bare ground more prevalent and more soil surface exposed to erosive elements. The dominant grasses are the bluegrass such as Sandberg, mutton, big, and Canby. Weedy annual species such as cheatgrass, kochia, Russian thistle, and a variety of mustards may occupy the site. Mountain big sagebrush is the dominant shrub. Noxious weeds such as Canada thistle may invade the site if a seed source is available. When compared with the Reference State (State 1) the annual production is less, as the major cool-season grasses are reduced, but the shrub production has increased significantly and compensates for some of the decline in the herbaceous production. The total annual production (air-dry weight) of this state is about 550 pounds per acre, but it can range from about 300 lbs./acre in unfavorable years to about 700 lbs./acre in above average years. Transitions or pathways leading to other plant communities are as follows: • Long-term prescribed grazing will convert this plant community to the Rhizomatous Wheatgrass/Mixed Shrub Plant Community. • Brush management or Wildfire with no change in grazing management will convert this plant community to the Bluegrass/Invasive Plant Community.

Resilience management. This plant community is resistant to change as the stand becomes more decadent. These areas may actually be more resistant to fire as less fine fuels are available and the bare ground between the shrubs is increased. The herbaceous component is not as diverse and plant vigor and species regeneration capabilities of cool-season perennials are deficient. The removal of grazing does not seem to affect the plant composition or structure of the plant community. Soil erosion is accelerated because of increased bare ground. Water flow patterns and pedestalling are obvious. Infiltration is reduced and runoff is increased. Rill channels may be noticeable in the interspaces and gullies may be establishing where rills have concentrated down slope.

Dominant plant species

- mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*), shrub
- Sandberg bluegrass (*Poa secunda*), grass

Dominant resource concerns

- Sheet and rill erosion
- Ephemeral gully erosion
- Classic gully erosion
- Terrestrial habitat for wildlife and invertebrates
- Feed and forage imbalance

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	185	336	432
Shrub/Vine	118	213	275
Forb	34	62	78
Total	**337**	**611**	**785**

Pathway CP 2.1-2.2
Community 2.1 to 2.2

Frequent and Severe Grazing and No fire • Frequent and Severe Grazing and no fire will convert the plant community to the Mixed Shrub/Bluegrass Plant Community. The probability of this occurring is high and is especially evident on areas where drought or heavy browsing does not adversely impact the shrub stand.

Pathway CP 2.2-2.1
Community 2.2 to 2.1

Long-term Prescribed Grazing • Long-term prescribed grazing will convert this plant community to the Rhizomatous Wheatgrass/Mixed Shrub Plant Community.

State 3
Threetip Sagebrush

The Threetip Sagebrush of the Shallow Loamy Ecological Site is dominated by Wyoming threetip sagebrush as a result of prescribed grazing and perpetuated by a fire cycle which maintains the removal of mountian big sagebrush. Bunchgrasses have been highly reduced and rhizomatous wheatgrasses have increased.

Characteristics and indicators. The Threetip Sagebrush State is characterized by the prominent cover of Wyoming threetip sagebrush up to 25 percent composition. The herbaceous component compared to the Reference State is mostly intact. Other shrubs cannot easily establish in this state when threetip becomes dominant.

Resilience management. This plant community is resistant to change as once three-tip becomes the dominant shrubs it is difficult for other shrubs to become established. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. The herbaceous component is mostly intact and plant vigor and replacement capabilities are sufficient. Water flow patterns and litter movement may be occurring but only on steeper slopes. Incidence of pedestalling is minimal. Soils are mostly stable and the surface shows minimum soil loss. The watershed is functioning and the biotic community is intact.

Dominant plant species

- Wyoming threetip sagebrush (*Artemisia tripartita ssp. rupicola*), shrub
- Montana wheatgrass (*Elymus albicans*), grass
- Letterman's needlegrass (*Achnatherum lettermanii*), grass
- prairie Junegrass (*Koeleria macrantha*), grass
- Sandberg bluegrass (*Poa secunda*), grass

Community 3.1
Montana Wheatgrass/Threetip Sagebrush Plant Community

This plant community currently is found under prescribed grazing and is perpetuated by a fire cycle which maintains the removal of big sagebrush. Wyoming threetip sagebrush and Montana wheatgrass are significant components of this plant community. Cool-season grasses remain an important component, but some bunchgrasses are not as abundant. Dominant grasses include Montana wheatgrass, prairie Junegrass, and rhizomatous wheatgrasses, and of less frequency Columbia needlegrass, Idaho fescue, bluebunch wheatgrass, and spike fescue. Grasses of secondary importance include one-spike oatgrass, slender wheatgrass, spike trisetum, and bluegrasses. Forbs commonly found in this plant community include phlox, groundsel, penstemon, larkspur, lupine, pussytoes, miner’s candle, hawksbeard, and milkvetch. Wyoming threetip sagebrush along with pockets of black sagebrush comprise as much as 25% of the total production. When compared to the Reference Plant Community (1.1), Montana wheatgrass, and rhizomatous wheatgrass have increased. Columbia needlegrass, bluebunch wheatgrass, spike fescue, and Idaho fescue have decreased. Production of cool-season grasses has remained about the same. Cheatgrass can be common and in large patches, but most invaded areas are relatively small. The total annual production (air-dry weight) of this state is about 775 pounds per acre, but it can range from about 450 lbs./acre in unfavorable years to about 900 lbs./acre in above average years. Transitions or pathways leading to other plant communities are as follows: • Prescribed grazing and brush management will convert this plant community to the Reference State (State 1). Controlling three-tip sagebrush is difficult as it is a strong resprouter. Reestablishing the black sagebrush or curl-leaf mountain mahogany and the antelope bitterbrush may be difficult and may take many years. • Heavy, continuous, season-long grazing will convert this plant community to a Rhizomatous Wheatgrass/Lettermans Needlegrass Plant community. More than likely, Wyoming threetip sagebrush will persist in

varying degrees as it is difficult to control and is a strong resprouter.

Resilience management. This plant community is resistant to change as once three-tip becomes the dominant shrubs it is difficult for other shrubs to become established. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. The herbaceous component is mostly intact and plant vigor and replacement capabilities are sufficient. Water flow patterns and litter movement may be occurring but only on steeper slopes. Incidence of pedestalling is minimal. Soils are mostly stable and the surface shows minimum soil loss. The watershed is functioning and the biotic community is intact.

Dominant plant species

- Wyoming threetip sagebrush (*Artemisia tripartita ssp. rupicola*), shrub
- Montana wheatgrass (*Elymus albicans*), grass
- prairie Junegrass (*Koeleria macrantha*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Table 9. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	325	560	656
Shrub/Vine	123	213	252
Forb	50	84	101
Total	**498**	**857**	**1009**

Figure 15. Plant community growth curve (percent production by month). WY0601, 15-19E all upland sites.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			5	15	40	20	10	10			

Community 3.2
Rhizomatous Wheatgrass/Letterman's Needlegrass Plant Community

This plant community currently is found under heavy continuous season-long grazing by livestock and is perpetuated by either brush management or a wildfire, which removes mountain big sagebrush from this plant community. Wyoming threetip sagebrush can be a significant component of this plant community, but also may be lacking. Some of the major cool-season bunchgrasses associated with this ecological site have been reduced and some may have been removed. Dominant grasses include rhizomatous wheatgrasses, Letterman's needlegrass, bluegrasses, prairie Junegrass, spike trisetum, and Montana wheatgrass, and of less frequency Columbia needlegrass, Idaho fescue, bluebunch wheatgrass, and spike fescue. Forbs commonly found in this plant community include phlox, groundsel, biscuitroot, locoweed, larkspur, lupine, pussytoes, miner’s candle, hawksbeard, and milkvetch. Wyoming threetip sagebrush can comprise as much as 25% of the total production. When compared to the Reference State (State 1), rhizomatous wheatgrass, prairie junegrass, and Montana wheatgrass have increased. Columbia needlegrass, bluebunch wheatgrass, Idaho fescue, and mountain big sagebrush have decreased or been removed. Production of the preferred cool-season grasses has been reduced. Cheatgrass can be common and in large patches, but mostly invaded areas are relatively small. The total annual production (air-dry weight) of this state is about 525 pounds per acre, but it can range from about 350 lbs./acre in unfavorable years to about 750 lbs./acre in above average years. Transitions or pathways leading to other plant communities are as follows: • Prescribed grazing will convert this plant community to the Montana Wheatgrass/Threetip Sagebrush Plant community. • Frequent and Severe Grazing will convert this plant community to a Bluegrass/Annual Plant Community. If three-tip sage is present more than likely it will persist in varying degrees as it is difficult to control.

Resilience management. This plant community is resistant to change as the herbaceous species present are well adapted to grazing and if Wyoming threetip sagebrush becomes the dominant shrub it is difficult for other shrubs to become established. However, species composition can be altered through long-term overgrazing. The herbaceous component is mostly intact, but some cool-season bunchgrasses associated with the site have been reduced or

removed. Plant vigor and replacement capabilities are sufficient for some species but not all. Water flow patterns and litter movement is occurring but only on steeper slopes. Incidence of pedestalling is moderate to slight. Soils are mostly stable and the surface shows minimum soil loss. The watershed is functioning and the biotic community is partially intact.

Dominant plant species

- Wyoming threetip sagebrush (*Artemisia tripartita ssp. rupicola*), shrub
- western wheatgrass (*Pascopyrum smithii*), grass
- Letterman's needlegrass (*Achnatherum lettermanii*), grass
- Sandberg bluegrass (*Poa secunda*), grass
- prairie Junegrass (*Koeleria macrantha*), grass
- spike trisetum (*Trisetum spicatum*), grass
- Montana wheatgrass (*Elymus albicans*), grass

Pathway CP 3.1-3.2
Community 3.1 to 3.2

Heavy, Continuous Season-long Grazing • Heavy, continuous, season-long grazing will convert this plant community to a Rhizomatous Wheatgrass/Lettermans Needlegrass Plant community. More than likely, threetip sagebrush will persist in varying degrees as it is difficult to control and is a strong resprouter.

Pathway CP 3.2-3.1
Community 3.2 to 3.1

Prescribed Grazing • Prescribed grazing will convert this plant community to the Montana Wheatgrass/Threetip Sagebrush Plant community

State 4
Bluegrass/Invasive

The Bluegrass/Invasive State is the defined by the prominent cover of bluegrasses and invasive species with the severely decreased or absence of preferred cool season mid-grasses. The state is a result of frequent and severe grazing, the removal of mountain big sagebrush, and proximity of seed source of invasive species.

Characteristics and indicators. Invasive and bluegrass species are the dominant plants in this state. Wyoming threetip sagebrush may be present as it is a strong resprouter and quickly re-establishes on sites after disturbance.

Resilience management. Soils in this state are susceptible to excessive erosion. Rill channels and gullies may be present on site or adjacent sites that are impacted due to proximity. Pedestalling around the base of plants is common.

Dominant plant species

- cheatgrass (*Bromus tectorum*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- Sandberg bluegrass (*Poa secunda*), grass
- Russian thistle (*Salsola kali*), other herbaceous

Dominant resource concerns

- Sheet and rill erosion
- Ephemeral gully erosion
- Classic gully erosion
- Surface water depletion
- Naturally available moisture use
- Plant productivity and health
- Plant structure and composition
- Terrestrial habitat for wildlife and invertebrates

- Feed and forage imbalance

Community 4.1
Bluegrass/Invasive Plant Community

This plant community evolved under frequent and severe grazing and the mountain big sagebrush shrub component has been removed by heavy browsing, wildfire or human means. Invasive species and bluegrasses are the most dominant plants and occupy any open bare ground area. Wyoming threetip sagebrush may or may not be present on this site. However, it is common for this shrub to occur as it is a strong resprouter and may quickly re-establish the site after a disturbance. Compared to the Reference State (State 1), invasive species and bluegrasses are widespread and virtually all of the major cool-season mid-grasses are absent or severely decreased. Mountain big sagebrush has also been removed. Invasive species may include cheatgrass, kochia, Russian thistle, and a variety of mustards. Bluegrass species will include Sandberg, mutton, Canby, and big. Noxious weeds such as Canada thistle may invade the site if a seed source is available. The interspaces between plants have expanded leaving the amount of bare ground more prevalent and more soil surface exposed to erosive elements. The total annual production (air-dry weight) of this state is about 375 pounds per acre, but it can range from about 200 lbs./acre in unfavorable years to about 500 lbs./acre in above average years. Transitions or pathways leading to other plant communities are as follows: • Prescribed grazing will convert this plant community to the Rhizomatous Wheatgrass/Lettermans Needlegrass Plant community.

Resilience management. This plant community is relatively stable and resistant to overgrazing. Annuals and bluegrasses are effectively competing against the establishment of perennial cool-season grasses. Plant diversity is greatly altered and the herbaceous component is not intact. Recruitment of the major perennial grasses is not occurring and the replacement potential is absent. The biotic integrity is missing. The soils are unstable and not protected from excessive erosion. Rill channels and maybe even gullies may be present on site and adjacent areas are impacted by excessive runoff. Water flow patterns and pedestalling are obvious. The watershed is not functioning.

Dominant plant species

- cheatgrass (*Bromus tectorum*), grass
- Sandberg bluegrass (*Poa secunda*), grass
- Russian thistle (*Salsola kali*), other herbaceous

Dominant resource concerns

- Sheet and rill erosion
- Ephemeral gully erosion
- Classic gully erosion
- Ground water depletion
- Plant productivity and health
- Plant structure and composition
- Terrestrial habitat for wildlife and invertebrates
- Feed and forage imbalance

Figure 16. Plant community growth curve (percent production by month). WY0601, 15-19E all upland sites.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			5	15	40	20	10	10			

Transition T 1-2
State 1 to 2

Heavy, Continuous Season-long Grazing and No Fire • Heavy, continuous, season-long grazing plus no fire will convert the plant community to the Rhizomatous Wheatgrass/ Mixed Shrub Plant Community. The probability of this occurring is high. This is especially evident on areas where drought or heavy browsing does not adversely impact the shrub stand.

Transition T 1-3
State 1 to 3

Repeated Wild Fire or Brush Management + Prescribed Grazing • Repeated Wild Fire or Brush Management + Prescribed Grazing will convert the Reference State (State 1) to the Montana Wheatgrass/Threetip Sagebrush/ Plant Community.

Restoration pathway R 2-1
State 2 to 1

Brush Management and Prescribed Grazing Prescribed grazing plus brush management will convert this plant community to near Reference Plant Community (1.1). If prescribed fire is used as a means to reduce or remove the shrubs, sufficient fine fuels will need to be present. This may require deferment from grazing prior to treatment. Post management is critical to ensure success. This can range from two or more years of rest to partial growing season deferment, depending on the condition of the understory at the time of treatment and the growing conditions following treatment. Seeding will be required regardless of the brush treatment to reestablish the major cool-season grasses.

Transition T 2-3
State 2 to 3

Wild Fire or Brush Management and No Change in Grazing • Brush management or Wildfire with no change in grazing management will convert this plant community to the Rhizomatous Wheatgrass/Lettermans Needlegrass Plant Community.

Transition T 2-4
State 2 to 4

Wild Fire or Brush Management and No Change in Grazing • Brush management or Wildfire with no change in grazing management will convert this plant community to the Bluegrass/Invasive Plant Community.

Restoration pathway R 3-1
State 3 to 1

Prescribed Grazing and Brush Management • Prescribed grazing and brush management will convert this plant community to the Reference State (State 1). Controlling Wyoming threetip sagebrush is difficult as it is a strong resprouter. Reestablishing the black sagebrush or mountain mahogany and the antelope bitterbrush may be difficult and may take many years.

Transition T 3-4
State 3 to 4

Frequent and Severe Grazing • Frequent and Severe Grazing will convert this plant community to a Bluegrass/Invasive Plant Community. If three-tip sage is present more than likely it will persist in varying degrees as it is difficult to control.

Restoration pathway R 4-3
State 4 to 3

Long-term Prescribed Grazing • Prescribed grazing will convert this plant community to the Rhizomatous Wheatgrass/Lettermans Needlegrass Plant community.

Additional community tables

Table 10. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					

Grass/Grasslike					
1	**Columbia needlegrass**			95–241	
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	95–239	–
2	**Idaho fescue**			95–241	
	Idaho fescue	FEID	*Festuca idahoensis*	95–239	–
3	**spike fescue**			95–241	
	spike fescue	LEKI2	*Leucopoa kingii*	95–239	–
4	**bluebunch wheatgrass**			95–191	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	95–191	–
5	**prairie Junegrass**			0–95	
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–95	–
6	**western wheatgrass**			0–95	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–95	–
7	**other grasses/grasslikes**			50–146	
	Grass, perennial	2GP	*Grass, perennial*	0–48	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–48	–
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	0–48	–
	nodding brome	BRAN	*Bromus anomalus*	0–48	–
	Pumpelly's brome	BRINP5	*Bromus inermis ssp. pumpellianus var. pumpellianus*	0–48	–
	mountain brome	BRMA4	*Bromus marginatus*	0–48	–
	sedge	CAREX	*Carex*	0–48	–
	California oatgrass	DACA3	*Danthonia californica*	0–48	–
	onespike danthonia	DAUN	*Danthonia unispicata*	0–48	–
	Montana wheatgrass	ELAL7	*Elymus albicans*	0–48	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–48	–
	needle and thread	HECO26	*Hesperostipa comata*	0–48	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–48	–
	spike trisetum	TRSP2	*Trisetum spicatum*	0–48	–
Forb					
8				0–95	
	Forb, perennial	2FP	*Forb, perennial*	0–48	–
	yarrow	ACHIL	*Achillea*	0–48	–
	agoseris	AGOSE	*Agoseris*	0–48	–
	rosy pussytoes	ANRO2	*Antennaria rosea*	0–48	–
	balsamroot	BALSA	*Balsamorhiza*	0–48	–
	field chickweed	CEAR4	*Cerastium arvense*	0–48	–
	larkspur	DELPH	*Delphinium*	0–48	–
	buckwheat	ERIOG	*Eriogonum*	0–48	–
	aster	EUCEP2	*Eucephalus*	0–48	–
	sunflower	HELIA3	*Helianthus*	0–48	–
	flax	LINUM	*Linum*	0–48	–

	desertparsley	LOMAT	*Lomatium*	0–48	–
	lupine	LUPIN	*Lupinus*	0–48	–
	phlox	PHLOX	*Phlox*	0–48	–
	stonecrop	SEDUM	*Sedum*	0–48	–
	groundsel	TEPHR3	*Tephroseris*	0–48	–
	American vetch	VIAM	*Vicia americana*	0–48	–
Shrub/Vine					
9	**mountain big sagebrush**			0–95	
	black sagebrush	ARNO4	*Artemisia nova*	0–95	–
	mountain mahogany	CERCO	*Cercocarpus*	0–95	–
10	**curl-leaf mountain mahogany**			0–95	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–48	–
	Saskatoon serviceberry	AMAL2	*Amelanchier alnifolia*	0–48	–
	big sagebrush	ARTR2	*Artemisia tridentata*	0–48	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	0–48	–

Animal community

Animal Community – Wildlife Interpretations

1.1 - Reference Plant Community: Columbia Needlegrass/Spike fescue: The predominance of grasses in this plant community favors grazers and mixed-feeders, such as deer, bison, elk, and antelope. Suitable thermal and escape cover for deer may be limited due to the low quantities of woody plants. However, topographical variations could provide some escape cover. Due to the location of these sites on the foot slopes of mountains they are valuable for elk and deer winter ranges. When found adjacent to sagebrush dominated states, this plant community may provide brood rearing/foraging areas for sage grouse, as well as lek sites. Other birds that would frequent this plant community include western meadowlark, lark bunting, sage thrasher, horned larks, red-tail and ferruginous hawks, and golden eagles. Many grassland obligate small mammals would occur here.

1.2 - Bluebunch Wheatgrass/Mixed Shrub Plant Community: The combination of an overstory of big sagebrush and an understory of grasses and forbs provides a very diverse plant community for wildlife. The crowns of sagebrush tend to break up hard crusted snow on winter ranges, so mule deer, elk, and antelope may use this state for foraging and cover year-round, as would cottontail and jack rabbits. It provides important winter, nesting, brood-rearing, and foraging habitat for sage grouse. Brewer’s sparrows’ nest in big sagebrush plants and hosts of other nesting birds utilize stands in the 20 to 30 percent cover range. Other birds that would frequent this plant community include western meadowlark, lark bunting, sage thrasher, horned larks, red-tail and ferruginous hawks, and golden eagles.

2.1 - Rhizomatous Wheatgrass/Mixed Shrub Plant Community: The combination of an overstory of big sagebrush and an understory of grasses and forbs provides a very diverse plant community for wildlife. The crowns of sagebrush tend to break up hard crusted snow on winter ranges, so mule deer, elk, and antelope may use this state for foraging and cover year-round, as would cottontail and jack rabbits. It provides important winter, nesting, brood-rearing, and foraging habitat for sage grouse. Brewer’s sparrows’ nest in big sagebrush plants and hosts of other nesting birds utilize stands in the 20 to 30 percent cover range. Other birds that would frequent this plant community include western meadowlark, lark bunting, sage thrasher, horned larks, red-tail and ferruginous hawks, and golden eagles.

2.2 - Mixed Shrub/Bluegrass Plant Community: This plant community can provide important winter foraging for elk, mule deer and antelope, as sagebrush can approach 15 percent protein and 40 to 60 percent digestibility during that time. This community provides escape and thermal cover for large ungulates, as well as nesting and brood rearing habitat for sage grouse. Other birds that would frequent this plant community include western meadowlark, lark bunting, sage thrasher, horned larks, red-tail and ferruginous hawks, and golden eagles. Due to the lack of

herbaceous production and diversity of mid cool season grasses on this site, it is not as beneficial to grazers.

3.1 - Montana Wheatgrass/Threetip Sagebrush Plant Community: The production of herbaceous species provided for good foraging to grazers. However, the lack of tall or mid growing shrubs does not benefit browsers nor provides cover for many wildlife species. As these site greens-up sooner in the spring, this site tends to provide early new growth for foraging large and small mammals. If located adjacent to shrub dominated sites, It provides good foraging habitat for sage grouse.

3.2 - Rhizomatous Wheatgrass/Letterman's Needlegrass Plant Community: The production of herbaceous species provided for good foraging for grazers. However, the lack of tall or mid growing shrubs does not benefit browsers nor provides cover for many wildlife species. As these site greens-up sooner in the spring, this site tends to provide early new growth for foraging large and small mammals. If located adjacent to shrub dominated sites, It provides good foraging habitat for sage grouse.

4.1 - Bluegrass/Invasive Plant Community: This community provides limited foraging for antelope and other grazers. They may be used as a foraging site by sage grouse if proximal to woody cover. Generally, these are not target plant communities for wildlife habitat management.

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)
Columbia Needlegrass/Spike fescue	500-1000	0.23
Bluebunch WG/Mixed Shrub	450-950	0.22
Rhizomatous WG/Mixed Shrub	400-800	0.18
Mixed Shrub/Bluegrass	300-700	0.15
Montana WG/Threetip Sagebrush	450-900	0.21
Rhizomatous WG/Letterman's Needlegrass	350-750	0.14
Bluegrass/Invasive	200-500	0.10

* - The Carrying capacity is calculated as the production for a normal year X .25 efficiency factor / 912.5 #/AUM to calculate the AUM's/Acre.

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide 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

Climate is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group D due to its shallow feature. Infiltration and runoff potential for this site varies from moderate to high depending on soil hydrologic group and water table. Runoff will be high on this site since the soil saturate easy and due to its shallow characteristic and water holding capacity. (Refer to Part 630, NRCS National Engineering Handbook for detailed hydraulic 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 such as bluebunch wheatgrass. 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 to 2 percent of the soil surface.

Recreational uses

This site provides hunting opportunities for upland game species. The wide varieties of plants that bloom from spring until fall have an esthetic value that appeals to visitors. Other recreational uses may include hiking, camping, and mountain biking.

Wood products

No appreciable wood products are present on the site.

Other products

Herbs: The forb species of the Shallow Loamy Ecological Site have medicinal characteristics and have been used by the Native Americans in this area and more recently by the naturopathic profession.

Ornamental Species: The forbs commonly found as well as the shrub component of these communities have been used in landscaping and xeriscaping.

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: Chris Krassin, Range Management Specialist, James Haverkamp, Range Management Specialist, Steven Gullion, Range Management Specialist, James Mischke, District Conservationist, and Everet Bainter, State Range Management Specialist. Other sources used as references include USDA NRCS Water and Climate Center, USDA NRCS National Range and Pasture Handbook, and USDA NRCS Soil Surveys from various counties.

Contributors

J. Haverkamp

Approval

Kirt Walstad, 4/30/2024

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	05/01/2008
Approved by	Kirt Walstad
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 0-30%.

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 2 (interspaces) to 6 (under plant canopy), but average values should be 3.5 or greater.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Describe A-horizons are greater than 6 inches (15 cm) with weak subangular blocky structure and brown in color (10YR 5/3). Soil OM is typically 2 to 3%.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Plant community consists of 55-80% grasses, 10% forbs, and 10-35% shrubs. Evenly distributed plant canopy (50-75%) and litter plus moderate infiltration rates result in minimal runoff. Basal cover is typically less than 10% and marginally affects runoff on this site. Surface rock fragments of 5-30% provide stability to the site, but reduce infiltration.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None

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 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 15-20% 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: 500-1000 lb/ac (750 lb/ac average); Metric 560 -1120 kg/ha (840 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 50% is the most common indicator of a threshold being crossed. Big sagebrush, black sagebrush, bluegrasses and rhizomatous wheatgrasses 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.
