USDA Natural Resources
Conservation Service

Ecological site EX043B23B168
Steep Loamy (SLy) Absaroka Upper Foothills

Last updated: 3/04/2024
Accessed: 05/02/2024

General information

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

MLRA notes

Major Land Resource Area (MLRA): 043B–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 >20% but < 70% (mostly 30-50%)
• Soils are:
o Moderately deep to very deep (20-79+ in. (50-200+ cm)
o Non-saline, sodic, or saline-sodic
o <3% stone and boulder cover and <20% cobble and gravel cover
o Not skeletal (<35% rock fragments) within 20” (51 cm) of mineral soil surface
o None to Slightly effervescent throughout top 20” (51 cm) of mineral soil surface
o Textures range from very fine sandy loam to clay loam in top 4” (10 cm) of mineral soil surface
o Clay content is ≤ 32% in top 4” (10 cm) of mineral soil surface
o Each following subsurface horizon has a clay content of ≥18% but <35% by weighted average

Associated sites

EX043B23B122	**Loamy (Ly) Absaroka Upper Foothills** Loamy sites will occur on the tops or gentle portions of the landform, while the steep loamy is on the side slopes and steeper portions.
EX043B23B130	**Overflow (Ov) Absaroka Upper Foothills** Overflow falls within the concave portions of these steep slopes where water will accumulate as it moves down hill.
EX043B23B162	**Shallow Loamy (SwLy) Absaroka Upper Foothills** Shallow loamy will occur along outcroppings of bedrock and the Steep loamy occurs either uphill or below the steep loamy.

Table 1. Dominant plant species

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

Legacy ID

R043BX668WY

Physiographic features

This site occurs on moderate to steep slopes. It is found on all exposures at higher elevations, but primarily on north and east slopes at lower elevations.

Table 2. Representative physiographic features

Landforms	(1) Foothills > Eroded fan remnant sideslope (2) Foothills > Escarpment (3) Foothills > Dip slope
Runoff class	Negligible to high
Elevation	6,000–9,000 ft
Slope	20–70%
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

Annual precipitation and modeled relative effective annual precipitation ranges from 15 to 19 inches (381 – 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, Tower Falls, Yellowstone Pk Mammoth are the only weather stations available to select within a close proximity in location and characteristics of 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)	17-57 days
Freeze-free period (characteristic range)	43-100 days
Precipitation total (characteristic range)	14-16 in
Frost-free period (actual range)	5-65 days
Freeze-free period (actual range)	22-108 days
Precipitation total (actual range)	14-16 in
Frost-free period (average)	36 days
Freeze-free period (average)	70 days
Precipitation total (average)	15 in

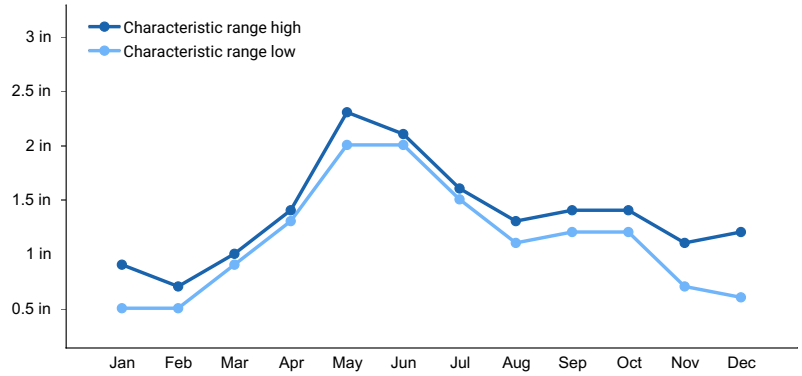


Figure 1. Monthly precipitation range

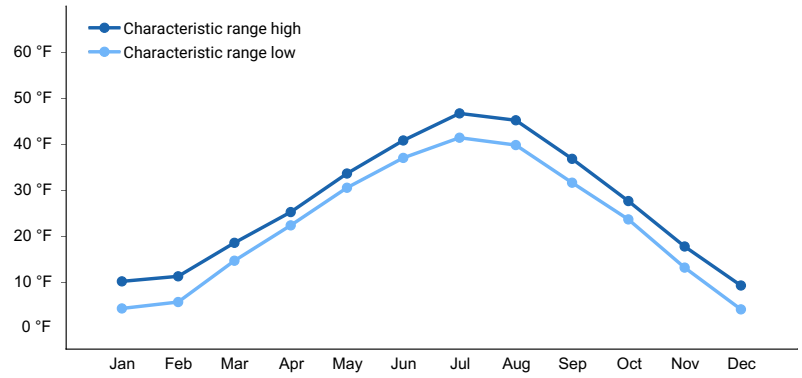


Figure 2. Monthly minimum temperature range

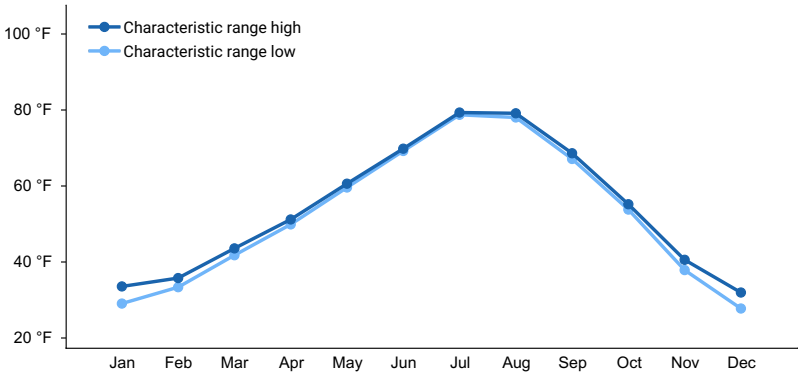


Figure 3. Monthly maximum temperature range

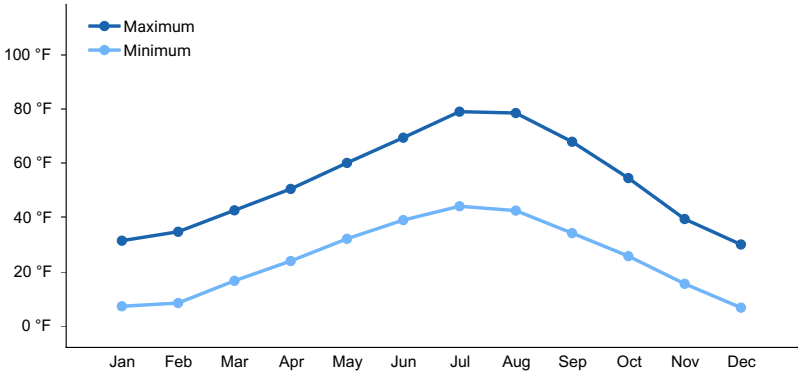


Figure 4. Monthly average minimum and maximum temperature

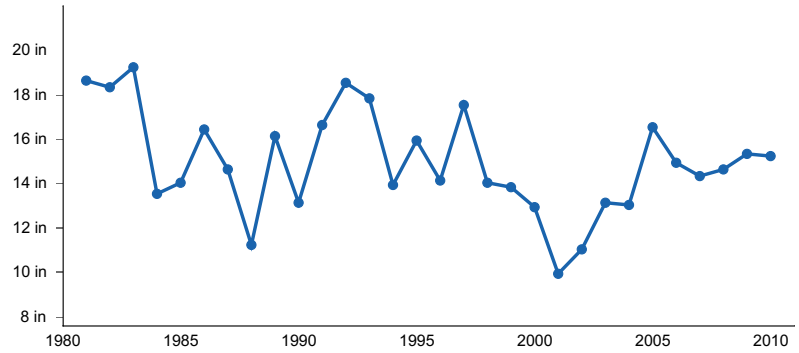


Figure 5. Annual precipitation pattern

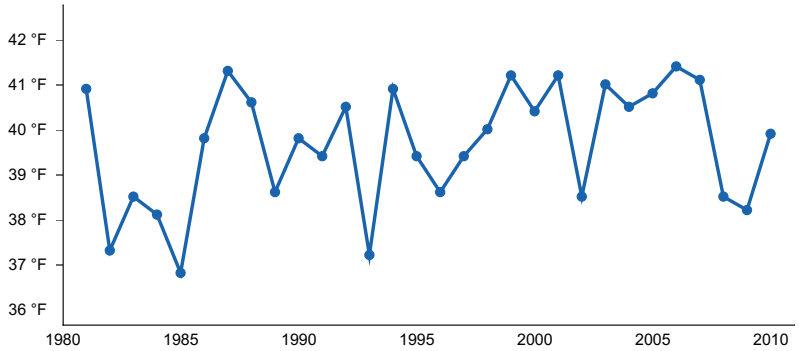


Figure 6. Annual average temperature pattern

Climate stations used

- (1) SUNSHINE 3NE [USC00488758], Meeteetse, WY
- (2) TOWER FALLS [USC00489025], Yellowstone National Park, WY
- (3) YELLOWSTONE PK MAMMOTH [USC00489905], Yellowstone National Park, WY

Influencing water features

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

Soil features

The soils of this site are moderately deep (greater than 20" to bedrock) to very deep and well-drained with textures ranging from very fine sandy loams through clay loams. The overlying soil is usually noncalcareous. These sites occur on slopes >20% and can typically be found on north and east aspects.

Figure 7. Hand excavated pit on a Steep Loamy ecological site.

Table 4. Representative soil features

Parent material	(1) Slope alluvium–igneous, metamorphic and sedimentary rock (2) Colluvium–interbedded sedimentary rock
Surface texture	(1) Gravelly sandy loam (2) Loam (3) Sandy clay loam
Family particle size	(1) Fine-loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderate
Soil depth	20–60 in
Surface fragment cover <=3"	0–15%
Surface fragment cover >3"	0–5%
Available water capacity (Depth not specified)	2.7–8.3 in
Calcium carbonate equivalent (Depth not specified)	0–14%
Electrical conductivity (Depth not specified)	0–4 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0–13
Soil reaction (1:1 water) (Depth not specified)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–15%
Subsurface fragment volume >3" (Depth not specified)	0–10%

Ecological dynamics

Potential vegetation on this site is dominated by mid cool-season perennial grasses. Other significant vegetation includes big sagebrush, rubber rabbitbrush, and a variety of forbs. The expected potential composition for this site is about 75% grasses, 15% forbs and 10% 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 big sagebrush, rubber rabbitbrush, and bluegrasses will increase. Cool season grasses such as Columbia needlegrass, spike fescue, and Idaho fescue will decrease in frequency and

production. As conditions deteriorate further, annuals such as cheatgrass will invade.

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

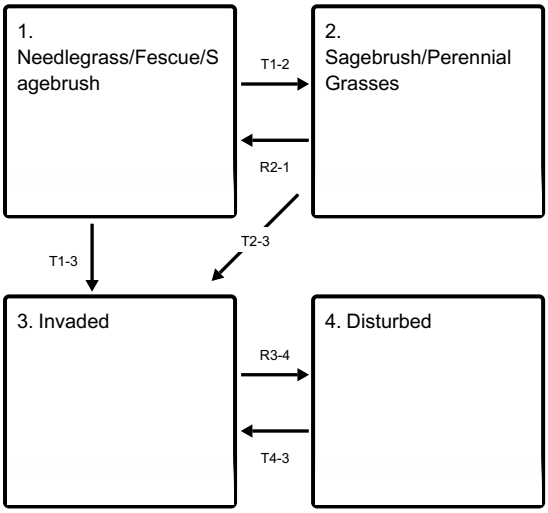
The big sagebrush component may not be as resilient once it has been removed or severely reduced, if a vigorous stand of grass exists and is maintained. The exception to this is where the herbaceous component is severely degraded at the time of treatment, growing conditions are unfavorable after treatment, 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 are established. This situation is more likely to develop in areas where fires have occurred in a relatively short cycle. Fringed sagewort 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 Community Phase (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

Ecosystem states



T1-2 - Frequent and severe grazing with the change in fire frequency, drought, and other significant impacts to the herbaceous cover force this transition.

T1-3 - Fire, drought, and other major disturbances with a seed source present aid in this transition.

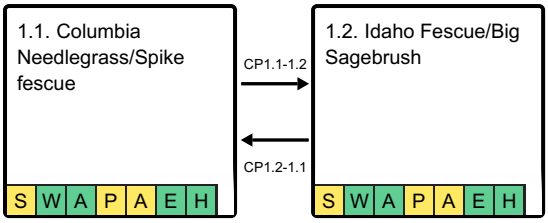
R2-1 - Prescribed grazing plus brush management will convert this plant community to near Reference.

T2-3 - Continued frequent and severe use patterns, significant soil disturbance, drought, and other catastrophic events with a seed source present will transition this site to the Invaded State.

R3-4 - An integrated weed management plan with a native seeding and long-term prescribed grazing aids the transition of this site.

T4-3 - Lack of management, continued disturbance, failure of a reclamation process, or catastrophic events with seed source present will transition this community to the invaded state.

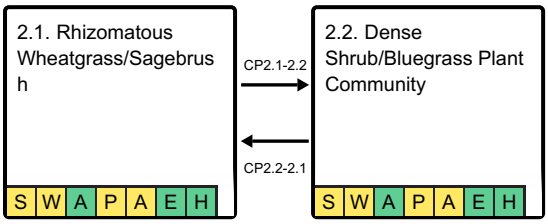
State 1 submodel, plant communities



CP1.1-1.2 - Moderate, continuous season-long grazing will convert the plant community to the Idaho Fescue/Big Sagebrush Plant Community.

CP1.2-1.1 - Prescribed grazing will convert this plant community to the Reference Community Phase.

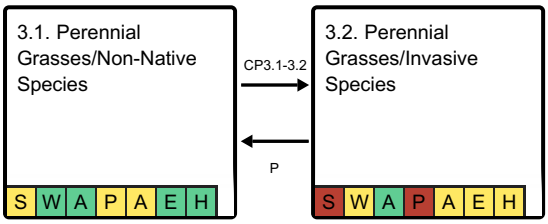
State 2 submodel, plant communities



CP2.1-2.2 - Prolonged continuous season-long grazing drives this change, and prolonged drought will exacerbate this transition.

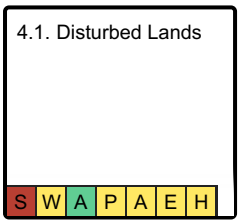
CP2.2-2.1 - Prescribed Grazing with rest and time will allow the tall-stature and desired grasses to regain vigor, once sagebrush has been managed.

State 3 submodel, plant communities



CP3.1-3.2 - Severe and frequent grazing (continuous season-long) alone, or with drought, fire or other disturbance, will encourage invasive species when a seed source is present.

State 4 submodel, plant communities



State 1
Needlegrass/Fescue/Sagebrush

Figure 8. Idaho fescue and spike fescue are increasing with sagebrush in this community.

The Needlegrass/Fescue/Sagebrush State (State 1) is the Reference State for the Steep Loamy ecological site. The diverse mix of perennial grasses, and forbs make for a productive and stable site.

Characteristics and indicators. Columbia needlegrass and spike fescue are the dominant herbaceous species on this site with an intermixed composition of mountain big sagebrush and fringed sagewort providing the dominant woody cover. Phlox and pussytoes are common in this community with other ground covering forbs.

Resilience management. The vegetation that thrives in the challenging conditions of the Steep Loamy ecological site creates a plant community resistant to change. But once disturbed, the shift in the perennial grasses and shift in shrubs is difficult and takes time to recover, reducing the resiliency of the community.

Community 1.1
Columbia Needlegrass/Spike fescue

The interpretive plant community for this site is the Reference Community Phase. This state evolved with grazing by large herbivores and periodic fires. Potential vegetation is about 75% grasses or grass-like plants, 15% forbs, and 10% woody plants. 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. The cyclical nature of the fire regime in this community prevents big sagebrush from being the dominant landscape. Cool-season tall and mid-stature grasses dominate the site. The major grasses include Columbia needlegrass, spike fescue, Idaho fescue, and bluebunch wheatgrass. Mountain big sagebrush is a conspicuous element of this site, occurs in a mosaic pattern, and makes up 5 to 10% of the annual production. Natural fire occurred in this community and prevented sagebrush from being the dominant landscape. A variety of forbs also occurs in this state and plant diversity is high (see Plant Composition Table). Annual production on this site ranges from 800 to 1300 pounds per acre depending on climatic conditions. The average annual production is 1100 pounds per acre.

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

- mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*), shrub
- Columbia needlegrass (*Achnatherum nelsonii*), grass
- spike fescue (*Leucopoa kingii*), grass
- Idaho fescue (*Festuca idahoensis*), grass
- arrowleaf balsamroot (*Balsamorhiza sagittata*), other herbaceous
- lupine (*Lupinus*), other herbaceous
- agoseris (*Agoseris*), other herbaceous

Dominant resource concerns

- Sheet and rill erosion

- Ephemeral gully erosion
- Aggregate instability
- Plant productivity and health
- Plant structure and composition
- Inadequate livestock water quantity, quality, and distribution

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	700	800	1000
Shrub/Vine	75	150	200
Forb	25	50	100
Total	**800**	**1000**	**1300**

Table 6. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	0%
Grass/grasslike basal cover	0%
Forb basal cover	0%
Non-vascular plants	0%
Biological crusts	0-5%
Litter	10-25%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-5%
Bedrock	0%
Water	0%
Bare ground	5-20%

Table 7. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	0-2%	0-5%	0-5%
>0.5 <= 1	–	0-5%	5-15%	0-10%
>1 <= 2	–	0-10%	5-50%	0-5%
>2 <= 4.5	–	0-5%	0-5%	0-5%
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

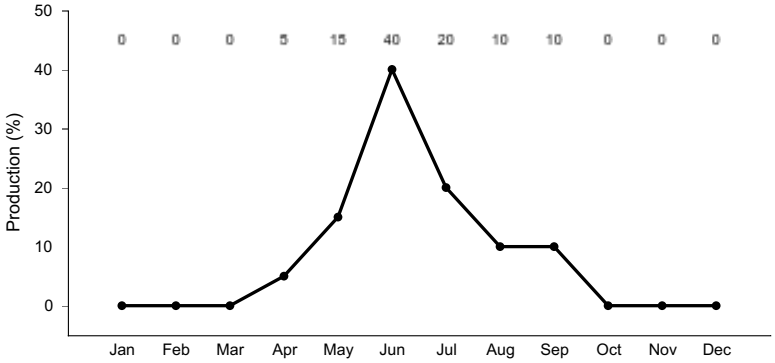


Figure 10. Plant community growth curve (percent production by month). WY0601, 15-19E all upland sites.

Community 1.2
Idaho Fescue/Big Sagebrush

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. Big sagebrush is an important component 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 Idaho fescue and bluebunch wheatgrass and of less frequency Columbia needlegrass and spike fescue. Grasses of secondary importance include prairie junegrass, rhizomatous wheatgrasses, bluegrasses, and spike trisetum. Forbs commonly found in this plant community include agoseris, balsamroot, phlox, buckwheat, pussytoes, hawksbeard, paintbrush, and western yarrow. Sagebrush and rubber rabbitbrush make up to 20% of the total annual production. When compared to the Reference Community Phase, mountain big sagebrush, rubber rabbitbrush, rhizomatous wheatgrasses, and bluegrasses have increased. Columbia needlegrass and spike fescue have decreased, often occurring only where protected from grazing by the sagebrush canopy. This Community Phase (1.2) produces between 700 and 1200 pounds per acre annually, depending on the growing conditions. Average annual production is 1000 pounds per acre.

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
- rubber rabbitbrush (*Ericameria nauseosa*), shrub
- prairie sagewort (*Artemisia frigida*), shrub
- Idaho fescue (*Festuca idahoensis*), grass
- bluebunch wheatgrass (*Pseudoroegneria spicata*), grass
- Montana wheatgrass (*Elymus albicans*), grass
- arrowleaf balsamroot (*Balsamorhiza sagittata*), other herbaceous
- common yarrow (*Achillea millefolium*), other herbaceous
- pussytoes (*Antennaria*), other herbaceous

Dominant resource concerns

- Ephemeral gully erosion
- Classic gully erosion
- Plant productivity and health
- Plant structure and composition
- Wildfire hazard from biomass accumulation
- Inadequate livestock water quantity, quality, and distribution

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	525	700	750
Shrub/Vine	150	250	350
Forb	25	50	100
Total	**700**	**1000**	**1200**

Table 9. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	0%
Grass/grasslike basal cover	0%
Forb basal cover	0%
Non-vascular plants	0%
Biological crusts	0-5%
Litter	10-25%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-5%
Bedrock	0%
Water	0%
Bare ground	10-25%

Table 10. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	0-5%	0-10%	0-10%
>0.5 <= 1	–	0-10%	0-25%	0-10%
>1 <= 2	–	5-10%	0-25%	0-5%
>2 <= 4.5	–	0-5%	0-5%	0-5%
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Pathway CP1.1-1.2
Community 1.1 to 1.2

Moderate, continuous season-long grazing will weaken the tall-stature cool-season grasses within this community allowing the mid-stature grasses to increase. With the decrease of taller grasses and continued stress on the herbaceous cover, the woody component, namely sagebrush will increase. This shift in disturbance will convert the plant community to the Idaho Fescue/Big Sagebrush Community Phase.

Pathway CP1.2-1.1
Community 1.2 to 1.1

Prescribed grazing will convert this plant community to the Reference Community Phase. 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 Community Phase. A prescribed fire treatment can be useful to hasten this transition if desired.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

State 2
Sagebrush/Perennial Grasses

Figure 12. Sagebrush in dense with an increasing forb cover and decline in key grass species.

After significant pressure on the herbaceous understory and with the lack of fire to rejuvenate the woody component, this State has shifted to a mid and short-stature cool-season grasses with shrubs becoming a significant component of this state. Some of the preferred grasses have been reduced or are absent, and forbs (ground covering) have increased in the community. When compared to the Reference State, sagebrush, native bluegrasses, prairie junegrass, and rhizomatous wheatgrasses have increased. Most of the preferred grasses have been reduced and some are absent.

Characteristics and indicators. Dominant grasses include rhizomatous wheatgrasses, prairie junegrass, Idaho fescue, and bluegrasses. Columbia needlegrass, spike fescue, and bluebunch wheatgrass are significantly reduced or absent. Grasses of secondary importance include slender wheatgrass, and spike trisetum. Forbs commonly found in this plant community include balsamroot, agoseris, buckwheat, arnica, phlox, lupine, asters, and pussytoes. Fringed sagewort, mountain big sagebrush, and juniper can make up to 30% of the total annual production.

Resilience management. This State is resistant to change without a major disturbance or inputs to start the change. But it is also at risk of degrading further and is susceptible to invasion due to the decreased herbaceous cover and increased woody structure.

Community 2.1
Rhizomatous Wheatgrass/Sagebrush

This plant community currently is found under continuous season-long grazing by livestock and protection from fire. Big sagebrush is a significant component of this plant community although rubber rabbitbrush may be as abundant. 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 wheatgrasses, Lettermans needlegrass, bluegrasses, and of less frequency Columbia needlegrass, spikefescue, Idaho fescue and bluebunch wheatgrass. Grasses of secondary importance include prairie junegrass, slender wheatgrass, spike trisetum and native bromes. Forbs commonly found

in this plant community include balsamroot, hawksbeard, paintbrush, groundsel, buckwheat, phlox, lupine, larkspur, sneezeweed, pussytoes, and American vetch. Big Sagebrush and rubber rabbitbrush can make up to 30% of the total annual production. When compared to the Reference Community Phase, big sagebrush, rubber rabbitbrush, bluegrasses, Lettermans needlegrass, and rhizomatous wheatgrasses have increased. Most of the preferred grasses have been reduced and some are absent. Some annuals, such as cheatgrass, as well as noxious weeds such as leafy spurge have invaded the site, but are not yet abundant.

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
- rubber rabbitbrush (*Ericameria nauseosa*), shrub
- Montana wheatgrass (*Elymus albicans*), grass
- Letterman's needlegrass (*Achnatherum lettermanii*), grass
- Cusick's bluegrass (*Poa cusickii*), grass
- common yarrow (*Achillea millefolium*), other herbaceous
- pussytoes (*Antennaria*), other herbaceous
- phlox (*Phlox*), other herbaceous

Dominant resource concerns

- Ephemeral gully erosion
- Sediment transported to surface water
- Plant productivity and health
- Plant structure and composition
- Wildfire hazard from biomass accumulation
- Feed and forage imbalance
- Inadequate livestock water quantity, quality, and distribution

Community 2.2
Dense Shrub/Bluegrass Plant Community

This plant community is the result of frequent and severe grazing and protection from fire. Mountain big sagebrush and rubber rabbitbrush are the dominant shrubs of this plant community as the annual production will exceed 30%. 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. Bluegrasses such as Cusick's, Sandberg, big, and Canby dominate the understory. When compared with the Reference State, 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.

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
- prairie sagewort (*Artemisia frigida*), shrub

- rubber rabbitbrush (*Ericameria nauseosa*), shrub
- Cusick's bluegrass (*Poa cusickii*), grass
- Sandberg bluegrass (*Poa secunda*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- pussytoes (*Antennaria*), other herbaceous
- common yarrow (*Achillea millefolium*), other herbaceous
- field chickweed (*Cerastium arvense*), other herbaceous

Dominant resource concerns

- Ephemeral gully erosion
- Aggregate instability
- Sediment transported to surface water
- Plant productivity and health
- Plant structure and composition
- Wildfire hazard from biomass accumulation
- Terrestrial habitat for wildlife and invertebrates
- Feed and forage imbalance
- Inadequate livestock water quantity, quality, and distribution

Pathway CP2.1-2.2
Community 2.1 to 2.2

The driver for this transition is the increase in sagebrush canopy and continued pressure on the herbaceous cover that moves this community to a shrub dominated phase. Grazing impacts with prolonged drought will convert this plant community to the Dense Shrub/Bluegrasses Community Phase.

Pathway CP2.2-2.1
Community 2.2 to 2.1

Prescribed grazing to allow rest (rest-rotation or deferred grazing) will encourage the desirable tall and mid-stature cool-season grasses to recover. Brush management will be necessary to reduce the woody cover to aid the grasses in recovery. With time, the community will increase in the desired grass species.

Conservation practices

Brush Management
Prescribed Burning
Critical Area Planting
Prescribed Grazing
Heavy Use Area Protection
Upland Wildlife Habitat Management

State 3
Invaded

Any disturbance provides an opportunity for aggressive species, such as many of our introduced invaders, to establish in a community. Catastrophic events or natural climatic events (drought, wildfire, etc) can be a source of this invasion.

Characteristics and indicators. The major indication of entering this State is the abundant or significant presence of an introduced species, whether invasive or just an invader. To meet the terms of abundant or significant, the presence has to account for greater than or equal to ten percent cover of the community. Species considered in this category are Kentucky bluegrass, smooth brome, or timothy for non-native invaders; or cheatgrass for invasive species. Thistle and common dandelion are other species of concern on this ecological site.

Resilience management. Once established, these aggressive and persistent species will exclude many of the native species and are extremely difficult to reduce or remove from the community. These species are able to tolerate repeated abuse and drastic climatic swings without losing their foothold in the community, creating a resistant and resilient community.

Community 3.1
Perennial Grasses/Non-Native Species

The Perennial Grasses/Non-Native Species Community Phase has maintained a representative sample of the perennial grasses and forbs that are typical of the site with a mixed shrub community. Non-native or invader species have established in the community and are a significant component in the community (10 percent or greater by foliar cover or 5 percent or greater by weight), and are prominent (referring to a more wide scale composition, not one isolated patch in an isolated portion of the landscape). Production of the desired perennial species is generally reduced but the total production is maintained or elevated due to the production potential of the non-native species. The species most common are timothy, Kentucky bluegrass, and common dandelion.

Resilience management. Rangeland Health Implications/Indicators: This plant community is resistant to change. These areas may be more prone to fire as fine fuels are more available. Plant diversity is moderate to poor. The plant vigor is diminished and replacement capabilities are limited due to the reduced number of cool-season grasses. Plant litter is noticeably more when compared to reference communities due to the potential biomass produced by the non-native species (species dependent). Soil erosion is variable depending on the species of invasion and the litter accumulation thus associated, this variability also applies to water flow patterns and pedestalling. Infiltration is reduced and runoff is increased due to loss of perennial vegetation and root density.

Dominant plant species

- Rocky Mountain juniper (*Juniperus scopulorum*), tree
- mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*), shrub
- Woods' rose (*Rosa woodsii*), shrub
- rubber rabbitbrush (*Ericameria nauseosa*), shrub
- prairie sagewort (*Artemisia frigida*), shrub
- Kentucky bluegrass (*Poa pratensis*), grass
- timothy (*Phleum pratense*), grass
- Idaho fescue (*Festuca idahoensis*), grass
- bluebunch wheatgrass (*Pseudoroegneria spicata*), grass
- Sandberg bluegrass (*Poa secunda*), grass
- thistle (*Cirsium*), other herbaceous
- phlox (*Phlox*), other herbaceous
- sulphur-flower buckwheat (*Eriogonum umbellatum*), other herbaceous
- common dandelion (*Taraxacum officinale*), other herbaceous

Dominant resource concerns

- Classic gully erosion
- Plant structure and composition
- Wildfire hazard from biomass accumulation
- Terrestrial habitat for wildlife and invertebrates
- Inadequate livestock water quantity, quality, and distribution

Community 3.2
Perennial Grasses/Invasive Species

The Perennial Grasses/Invasive Species Community Phase has maintained a fractured sample of the perennial grasses and forbs that are typical of the site with invasive species. This plant community evolved under frequent and severe grazing. The shrub component has been impacted and possibly removed by heavy browsing, wildfire or human means. Weedy annuals and bluegrasses are the most dominant plants. Invasive species, most commonly cheatgrass, hold a significant (10 percent or greater) composition of the landscape, and are prominent (referring to a more wide scale composition, not isolated patches on the landscape). Fringed sagewort and rubber rabbitbrush

may be more abundant than other shrubs, as they are strong resprouters and may quickly re-establish the site after a disturbance. The interspaces between plants have expanded leaving the amount of bare ground more prevalent and more soil surface exposed to erosive elements. With the decrease or loss of most desirable mid-stature cool-season grasses, bluegrass will persist on the site (bluegrass includes natives: Sandberg, mutton, Canby, and big; as well as introduced species: Kentucky). Smooth brome, dandelion, and other introduced species will increase if present on the site. Other noxious weeds such as Canada thistle may invade the site if a seed source is available. Production of the desired perennial species is generally reduced but the total production is maintained or elevated due to the production potential of the invasive species.

Resilience management. Rangeland Health Implications/Indicators: This plant community is resistant to continued herbivory. 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 state is unstable and is 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

- Rocky Mountain juniper (*Juniperus scopulorum*), tree
- mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*), shrub
- prairie sagewort (*Artemisia frigida*), shrub
- snowberry (*Symphoricarpos*), shrub
- Woods' rose (*Rosa woodsii*), shrub
- cheatgrass (*Bromus tectorum*), grass
- sixweeks fescue (*Vulpia octoflora*), grass
- Sandberg bluegrass (*Poa secunda*), grass
- Idaho fescue (*Festuca idahoensis*), grass
- phlox (*Phlox*), other herbaceous
- sulphur-flower buckwheat (*Eriogonum umbellatum*), other herbaceous
- common dandelion (*Taraxacum officinale*), other herbaceous
- common yarrow (*Achillea millefolium*), other herbaceous

Dominant resource concerns

- Sheet and rill erosion
- Ephemeral gully erosion
- Classic gully erosion
- Sediment transported to surface water
- Plant productivity and health
- Plant structure and composition
- Plant pest pressure
- Wildfire hazard from biomass accumulation
- Terrestrial habitat for wildlife and invertebrates
- Feed and forage imbalance
- Inadequate livestock water quantity, quality, and distribution

Pathway CP3.1-3.2
Community 3.1 to 3.2

Frequent and Severe Grazing will convert this plant community to a Perennial Grasses/Invasive Species Community Phase. Drought or a fire (man-made or wild) are drivers that will encourage this transition as well, if a seed source is present. If fringed sagewort and common yarrow are present more than likely it will persist in varying degrees as it is difficult to control.

Pathway P
Community 3.2 to 3.1

State 4
Disturbed

Catastrophic natural events, including fresh land slides, fire followed by extreme climatic events, or areas that are heavily impacted by recreational vehicles, trails, roadways, or other land disturbances have reduced or removed most native perennial vegetation and left a highly disturbed land. These points of disturbance can be large scale, encompassing several ecological sites. However, many times they are isolated in nature, especially on steeper sloeps. The Disturbed State could be drafted as a stand-alone box within the state and transition model diagram. No matter what state a site originally is ranked in, once the site is mechanically disturbed, or suffers a catastrophic or significant natural disaster that alters the soil properties (erosional, depositional, hydrological or chemical), the site potential is altered. Mechanical disturbances and reclamation practices using non-native species could qualify some stages of this state to be considered as a land use shift. The result is the shift in potential and response in management so that it is no longer similar to the reference community. The potential shifts are highly variable, so a dynamic state was captured to highlight the altered communities that exist on the landscape.

Characteristics and indicators. The soil disturbance and mechanical or physical removal of the vegetative canopy is the key characteristic of the Disturbed State. The initial indicators are the primary successional species that establish following a disturbance including Russian thistle, kochia, six weeks fescue, and sunflowers. These initial colonizers will then be followed by any seeded species, or other species from within the locations seed bank.

Resilience management. The Disturbed State is highly variable and in a state of flux as the successional processes occur. Continued disturbance of this community is a potential threat; and the community is at high risk of transitioning to the Invaded State.

Community 4.1
Disturbed Lands

The title Disturbed Lands is encompassing two broad classifications of these land types. Go-back fields or tilled areas form Type one. The slope of the Steep Loamy ecological site does not lend well for this type of disturbance. However, in a similar process, mined lands or lands affected by energy development including gravel or mineral excavation pits, transmission corridors, transportation corridors and oil and gas development sites provide a host of successional processes. Many times, these locations are re-exposed to disturbance frequently by mechanical means leaving annual weeds and primary successional species as the dominate canopy. Older, established sites or abandoned locations, have established communities similar to those expected on go-back fields and may be stable in nature. A subset of Type one are those areas that were or currently are being impacted by recreation - camp sites, trails, parking areas, roadways. The varying stages of healing once abandoned, or the state of disturbance at each location leave a variable community. The growth curve of this plant community will vary depending on the species that are selected for seeding. For a more accurate portrait of the growth curve for the seeded community, the species used and the climatic tendencies of the region must be considered.

Resilience management. The plant community is variable and depending on the slope extent, age of the stand, and the stage of successional tendencies that the location is in will determine how stable (resilient/resistant) the community is. Plant diversity is generally strong, but is usually lacking in the structural and functional groups that are desired on the site. Soil erosion is variable depending on the slope extent and the disturbance regime that is occurring on the site and will vary with the specific community that has established on a specific location. Site-specific evaluation is needed to determine the water flow and pedestalling as well as infiltration and runoff potential and associated risks for each community.

Dominant resource concerns

- Sheet and rill erosion
- Ephemeral gully erosion
- Classic gully erosion
- Compaction
- Aggregate instability
- Plant productivity and health
- Plant structure and composition
- Terrestrial habitat for wildlife and invertebrates
- Feed and forage imbalance

- Inadequate livestock shelter
- Inadequate livestock water quantity, quality, and distribution

Transition T1-2
State 1 to 2

Needlegrass/Fescue/Sagebrush

Sagebrush/Perennial Grasses

Heavy, continuous, season-long grazing plus no fires or altered fire frequency will convert the plant community to the Sagebrush/Perennial Grasses State. This is especially evident on areas where drought or heavy browsing has adversely impact the shrub stand. The impacts required to force this transition are significant, and this does not happen in a short time period.

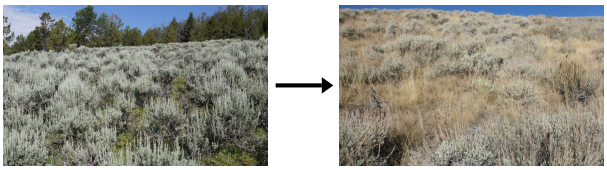
Constraints to recovery. The loss of sagebrush in some of these communities and the lack of necessary seed bank and recovery time are limiting factors for this State to recover. Slope and erosional risks are also slows or inhibits recovery.

Transition T1-3
State 1 to 3

Fire, wild or prescribed, with no change in grazing management and seed source present allows for a rapid transition to the Invaded State. Drought or other catastrophic events will aid in this transition.

Constraints to recovery. The lack of effective treatment to eradicate or significantly control invasive species long term or to remove non-native species without impact to the native community limit the recovery of this State.

Restoration pathway R2-1
State 2 to 1



Sagebrush/Perennial Grasses

Needlegrass/Fescue/Sagebrush

Prescribed grazing plus brush management will convert this plant community to near Reference. 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 T2-3
State 2 to 3

Drought, soil disturbances, or high-intensity grazing with a seed source present can open the soil surface and weaken the sod allowing invasive species to establish. Fire is a primary means of provide the niche for cheatgrass to establish on this site.

Constraints to recovery. The nature of non-native (introduced) as well as invasive species, especially cheatgrass, once they are established, they are prolific reproducers and are hardy plants, making it costly and difficult (if even possible) to remove. The lack of key grass species also limits recover of this site.

Restoration pathway R3-4
State 3 to 4

Integrated Pest Management, with Seeding the site to a native mixture - Success is not known to have occurred, and is rated to be low and highly variable for the rate of control of most species. Cheatgrass is one of the most invasive species for many of these sites, although there are other challenges. With intensive weed control and inputs this community can resemble an at-risk community within the reference state, but it is not possible to reach the reference community condition once there is a significant composition of non-native and invasive species that have established on a site.

Context dependence. Access due to slope limit areas that can readily be treated.

Conservation practices

Critical Area Planting
Prescribed Grazing
Grazing Land Mechanical Treatment
Range Planting
Heavy Use Area Protection
Integrated Pest Management (IPM)
Upland Wildlife Habitat Management

Transition T4-3
State 4 to 3

Lack of management resulting in continued disturbance, catastrophic events, or failure in the restoration process are major causes for a disturbed or altered landscape to transition to an invaded state.

Constraints to recovery. The change in the soils and potentially the hydrology of the site as well as the presence of invasive species limit the recovery potential of this community. Access limitations due to slope will limit the types of treatment and ability to manage a community.

Additional community tables

Table 11. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall-Stature Cool-Season Bunchgrasses**			200–700	
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	100–450	10–30
	spike fescue	LEKI2	*Leucopoa kingii*	50–150	5–10
	mountain brome	BRMA4	*Bromus marginatus*	0–50	0–5
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	0–50	0–5
2	**Mid-Stature, Cool-Season Bunchgrasses**			50–200	
	Idaho fescue	FEID	*Festuca idahoensis*	50–100	5–10
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	50–100	5–10
3	**Short-Stature, Cool-Season Bunchgrasses**			50–150	
	Cusick's bluegrass	POCU3	*Poa cusickii*	0–100	0–10
	Sandberg bluegrass	POSE	*Poa secunda*	0–50	0–5
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–50	0–5
	spike trisetum	TRSP2	*Trisetum spicatum*	0–50	0–5
4	**Miscellaneous Grasses/Grass-Likes**			0–50	
	threadleaf sedge	CAFI	*Carex filifolia*	0–50	0–5
	needleleaf sedge	CADU6	*Carex duriuscula*	0–50	0–5
	Grass, perennial	2GP	*Grass, perennial*	0–50	0–5
8	**Rhizomatous Cool-season Grasses**			0–100	
Forb					
5	**Forbs**			25–100	
	Forb, perennial	2FP	*Forb, perennial*	0–50	0–5
	agoseris	AGOSE	*Agoseris*	0–50	0–5
	milkvetch	ASTRA	*Astragalus*	0–50	0–5
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	0–50	0–5
	Indian paintbrush	CASTI2	*Castilleja*	0–50	0–5
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	0–50	0–5
	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	0–50	0–5
	green gentian	FRASE	*Frasera*	0–50	0–5
	common sneezeweed	HEAU	*Helenium autumnale*	0–50	0–5
	flax	LINUM	*Linum*	0–50	0–5
	American vetch	VIAM	*Vicia americana*	0–50	0–5
Shrub/Vine					
6	**Primary Shrubs**			0–150	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	0–150	0–15
7	**Miscellaneous Shrubs**			0–50	
	prairie sagewort	ARFR4	*Artemisia frigida*	0–50	0–5
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–50	0–5
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–50	0–5

Animal community

Wildlife Interpretations

1.1 - Columbia Needlegrass/Spike fescue Plant Community (Reference): 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 - Idaho Fescue/Big Sagebrush 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 20-30% 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/Big Sagebrush 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 20-30% 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 - Dense Shrub/Bluegrass Plant Community: This plant community can provide important winter foraging for elk, mule deer and antelope, as sagebrush can approach 15% protein and 40-60% 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 - Invaded Plant Community: This community provides limited foraging for elk 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 Carrying Capacity*
(lb./ac) (AUM/ac)
Columbia Needlegrass/Spikefescue 800-1300 .4
Idaho Fescue/Big Sagebrush 700-1200 .35
Rhizomatous WG/Big Sagebrush
Dense Shrub/Bluegrass
Invaded

* - 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 seasonal 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.

Fencing, slope length, management, access, terrain, kind and class of livestock, and breeds are all factors that can increase or decrease the percent of graze-able acres within a management unit. Adjustments should be made that incorporate these factors when calculating stocking rates.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group B and C, with localized areas in hydrologic group D. Infiltration ranges from moderately slow to moderate. Runoff potential for this site varies from low to rapid depending on soil hydrologic group, slope and ground cover. In many cases, areas with greater than 75% ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where short-grasses form a strong sod and dominate the site. 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).

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 included hiking, camping, mountain biking, and in the winter snowshoeing and cross-country skiing.

Wood products

No appreciable wood products are present on the site.

Other products

None noted.

Inventory data references

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 the development of the new concept for the Steep Loamy ecological site include: Blaise Allen, 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. 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 IV, and USDA NRCS Soil Surveys from various counties.

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 (9.6 hoop used to estimate 10 points, clipped a minimum of 3 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.)

Other references

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Approval

Kirt Walstad, 3/04/2024

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	04/08/2020
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills on steeper slopes are common. Rill occurrence may increase slightly on areas located below exposed bedrock or other water shedding areas where increased runoff may occur. Rills should be <2 inches deep, short to moderate in length (4 to 10 feet) and somewhat widely spaced (4-8 feet). An increase in rill development may be observed immediately following major thunderstorm or spring runoff events.

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2. **Presence of water flow patterns:** Sinuous flow patterns are common and wind around perennial plants and any surface rock. Evidence of flow patterns is expected to increase somewhat as slopes approach 80%. Water flow patterns can be long (10 to 20 feet), somewhat narrow (1 to 2 feet wide), and spaced widely (5 to 10 yards) and more closely spaced (3 to 6 yards) on slopes nearing 70 to 80%.

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3. **Number and height of erosional pedestals or terracettes:** Small pedestals will form at the base of plants that occur on the edge of water flow patterns, 2 to 4% of plants show minor exposed roots. Terracettes are fairly common, forming behind debris dams of small to medium sized litter (up to 2 inches in diameter) in water flow patterns. These debris dams may accumulate smaller litter (leaves, grass and forb stems) and sediment.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 20–30%. (Soil surface is typically covered by 0-15% surface fragments). Most bare ground is associated with water flow patterns, rills, and gullies. Bare ground spaces not associated with flow patterns should not be greater

than 1 to 2 feet in diameter.

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5. **Number of gullies and erosion associated with gullies:** A few gullies may occur. Any gullies present may extend down the length of the site until they reach a stream or other area where water and sediment is diverted or accumulates. Gullies show slightly more indication of erosion as slopes approach 75%, or where the site occurs adjacent to watershed areas with concentrated flow patterns.

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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):** Because of the sites very steep slopes, some litter redistribution downslope caused by water movement is normal. Some litter removal may occur in flow channels with deposition occurring within 3 to 5 feet at points of obstruction. The majority of litter still accumulates at the base of plants. Some grass leaves, stems and small woody twigs may accumulate in soil depressions adjacent to plants. Large woody debris will show only slight movement down slope. A slight increase in litter movement is expected following runoff resulting from heavy spring runoff or thunderstorms.

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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. Vegetation cover, litter, biological soil crusts and any surface rock present reduce erosion.

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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. Described A-horizons vary from 6-23 inches (15-58 cm) with OM of 2 to 5%.

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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 75-80% grasses, 15% forbs, and 5-10% 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.

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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):** No compaction layer or soil surface crusting should be present

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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-stature, cool season bunchgrasses (3 species)

    Sub-dominant: Short-stature. cool season bunchgrasses (1 Species)>perennial shrubs (1 Species) = perennial forbs

    Other: Community 1.1 = Perennial Mid-Stature bunchgrasses > Perennial Short-stature bunchgrasses > Perennial Forbs = Shrubs
    12b. F/S Groups not expected for the site: Annual Grass
    12c. Number of F/S Groups: 5 groups

12d. Species number in Dominate and Sub-dominate F/S Groups: 5 species

Additional: Following a recent disturbance such as fire, drought or insects that may remove the woody vegetation, forbs and perennial grasses (herbaceous species) may become more dominate in the community. These conditions may reflect a different functional community phase within the reference state.

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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. During years with average to above-average precipitation, there should be very little recent mortality or decadence apparent in shrubs or grasses. During severe (multi-year) drought up to 20% of the shrubs may die, either from drought, insect damage or pathogens.

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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: 800-1300 lb/ac (1050 lb/ac average); Metric 896-1457 kg/ha (1176 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 30% is the most common indicator of a threshold being crossed. Big sagebrush, rubber rabbitbrush, and bluegrasses are common increasers. Kentucky bluegrass, common dandelion, thistles, and annual weeds such as kochia 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.
