USDA Natural Resources Conservation Service

Ecological site EX043B23B106
Clayey Overflow (CyO) Absaroka Upper Foothills

Last updated: 3/04/2024
Accessed: 05/17/2024

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 significant additional effective moisture as overland flow.
• Slope is less than or equal to 30 percent
• Soils are:
o Moderately deep to very deep (20-80+ in. (50-200+ cm)
o Less than 3 percent stone and boulder cover and occasionally up to 10 percent cobble and gravel cover
o Not skeletal (less than 35% rock fragments) within 20 inches (50 cm) of mineral soil surface
o None to Slightly effervescent throughout top 20 inches (50 cm) of mineral soil surface
o Non-saline, sodic, or saline-sodic
o Textures range from fine sandy loam to clay in top 4 inches (10 cm) of mineral soil surface
o Clay content is greater than or equal to 18 percent in top 4 inches (10 cm) of mineral soil surface
o All subsurface horizons in the particle size control section have a weighted average of greater than 35 percent clay. (The particle size control section is the segment of the profile from either the start of an argillic horizon for 50 cms or from 25-100 cms).

Associated sites

EX043B23B109	**Cobbly Upland (CoU) Absaroka Upper Foothills** Cobbly Upland sites will contain inclusions of Clayey Overflow in concave positions of a slope.
EX043B23B104	**Clayey (Cy) Absaroka Upper Foothills** Clayey sites will contain inclusions of Clayey Overflow in concave positions of a slope.
EX043B23B128	**Lowland (LL) Absaroka Upper Foothills** Depositional areas or areas that do not receive influence from the water table within the Lowland site may contain clayey overflow.
EX043B23B175	**Skeletal (Sk) Absaroka Upper Foothills** Skeletal sites will contain inclusions of Clayey Overflow in concave positions of a slope.

Similar sites

EX043B23B130	**Overflow (Ov) Absaroka Upper Foothills** Overflow has a higher diversity of plant species and is more productive than the clayey overflow site. The heavy/fine soil texture limits the clayey overflow.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata ssp. vaseyana* (2) *Symphoricarpos occidentalis*

Herbaceous	(1) *Leymus cinereus* (2) *Elymus trachycaulus*

Legacy ID

R043BX606WY

Physiographic features

The Clayey Overflow ecological site is located on nearly level to rolling lands with 30 percent or less slope; either adjacent to streams that run water at least during the major part of the growing season or on alluvial fans adjacent to toe slopes or foothills.

Table 2. Representative physiographic features

Landforms	(1) Foothills > Alluvial fan (2) Foothills > Drainageway (3) Foothills > Stream terrace
Runoff class	Low to high
Flooding duration	Extremely brief (0.1 to 4 hours) to brief (2 to 7 days)
Flooding frequency	Occasional to frequent
Elevation	1,829–2,743 m
Slope	0–30%
Aspect	Aspect is not a significant factor

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, Yellowstone Park Mammoth, and Tower Falls are the only available weather stations 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)	17-57 days
Freeze-free period (characteristic range)	43-100 days
Precipitation total (characteristic range)	356-406 mm

Frost-free period (actual range)	5-65 days
Freeze-free period (actual range)	22-108 days
Precipitation total (actual range)	356-406 mm
Frost-free period (average)	36 days
Freeze-free period (average)	70 days
Precipitation total (average)	381 mm

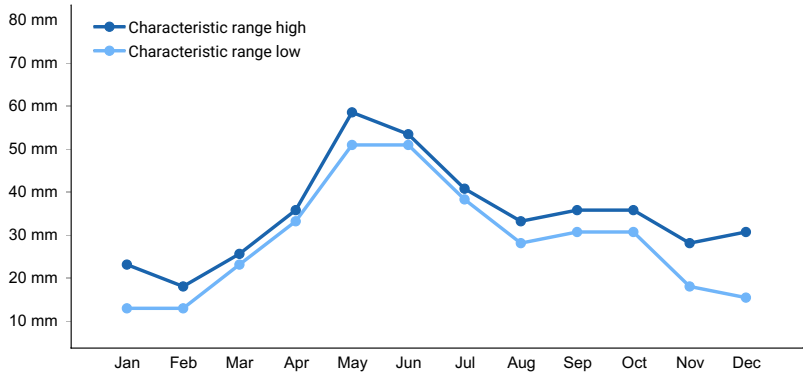


Figure 1. Monthly precipitation range

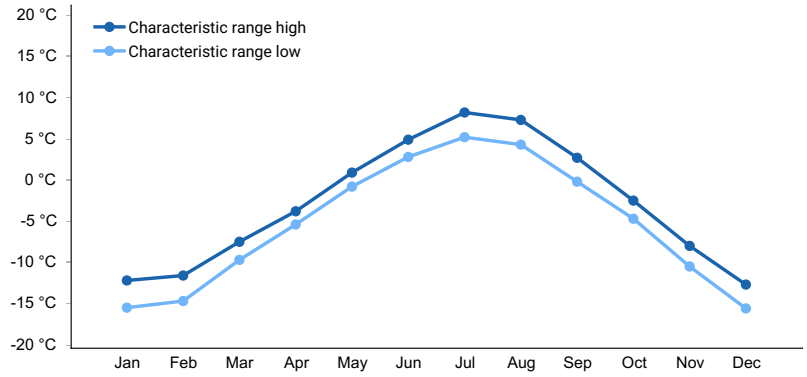


Figure 2. Monthly minimum temperature range

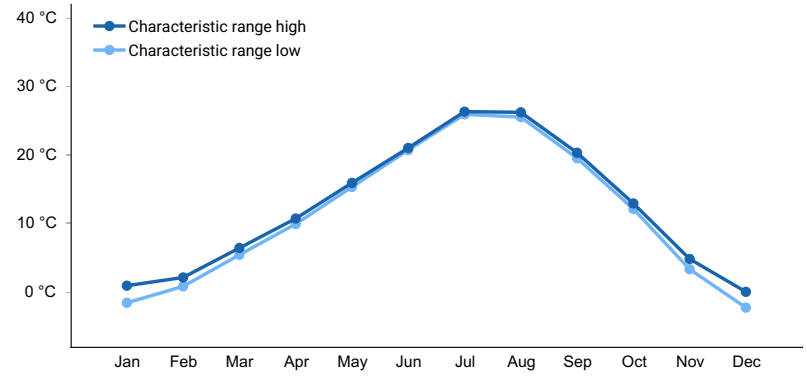


Figure 3. Monthly maximum temperature range

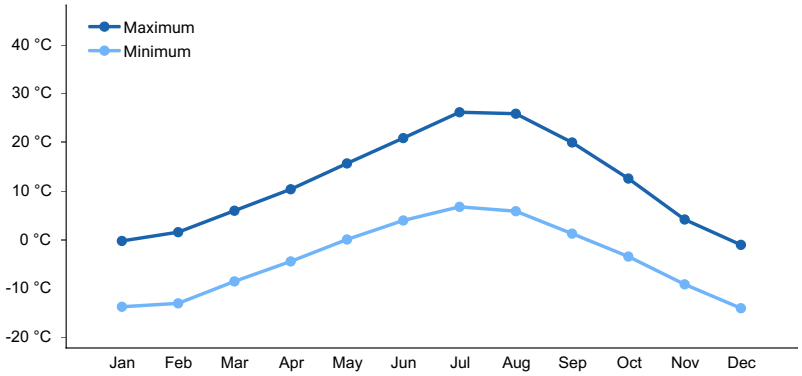


Figure 4. Monthly average minimum and maximum temperature

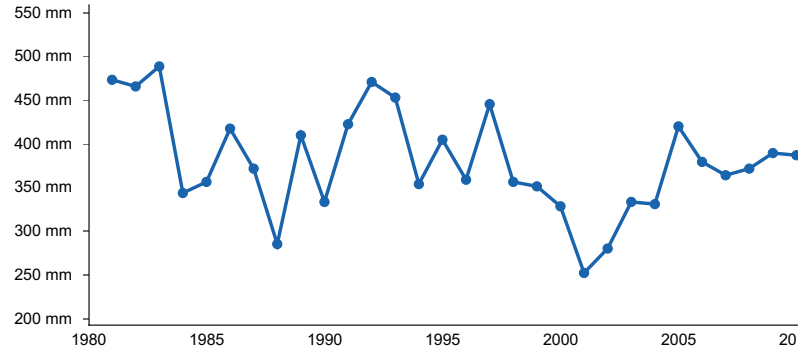


Figure 5. Annual precipitation pattern

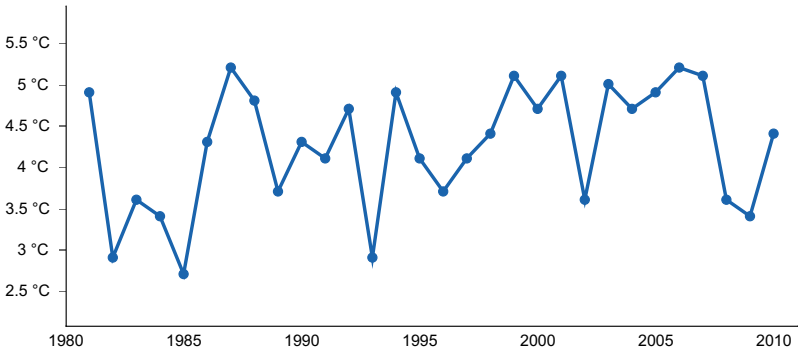


Figure 6. Annual average temperature pattern

Climate stations used

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

Influencing water features

The characteristics of these upland soils have no influence from ground water (water table below 60 inches (150 cm)). This site is characterized by the influence from surface water/overland flow from adjacent slopes, that has created a long-term shift in vegetation. The hydrology reflects more of a lowland position, lacking the ground water influence. These soils are prone to drought effects due to the hydrologic relationship to precipitation rather than to ground water. Isolated features that are affected by snow pack may connect and will persists longer than surrounding areas due to position on the landform (shaded/protected pockets).

Soil features

The soils of this site are very deep to moderately deep (greater than 20" to bedrock), moderately well to well-drained that formed in alluvium or alluvium over residuum. These soils have slow to moderate permeability. The

surface soil will vary from 2 to 5 inches deep. These soils may develop severe cracks. The soil characteristics having the most influence on plants are the heavy texture and the additional available moisture. These areas receive additional water from overflow of intermittent streams or runoff from adjacent slopes.

Table 4. Representative soil features

Parent material	(1) Slope alluvium–igneous, metamorphic and sedimentary rock (2) Residuum–shale and siltstone
Surface texture	(1) Cobbly, gravelly clay loam (2) Clay (3) Silty clay loam (4) Sandy clay loam
Drainage class	Moderately well drained to somewhat poorly drained
Permeability class	Very slow to moderate
Soil depth	51 cm
Surface fragment cover <=3"	0–15%
Surface fragment cover >3"	0–10%
Available water capacity (Depth not specified)	5.08–15.75 cm
Calcium carbonate equivalent (Depth not specified)	0–5%
Clay content (10.2-50.8cm)	35–60%
Electrical conductivity (Depth not specified)	0–2 mmhos/cm
Soil reaction (1:1 water) (Depth not specified)	6.4–8.4
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 tall and mid cool-season perennial grasses. Other significant vegetation includes mountain big sagebrush, silver sagebrush, rubber rabbitbrush, and a variety of forbs. The expected potential composition for this site is about 75 percent grasses, 15 percent forbs and 10 percent 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 rhizomatous wheatgrasses, bluegrasses, and mountain big sagebrush will increase. Weedy annuals will invade. Cool-season grasses such as, basin wildrye, Columbia needlegrass, and slender wheatgrass will decrease in frequency and production.

In some instances, mountain big sagebrush may become dominant on areas with an absence of fire and sufficient amount of overflow. If treatment of a stand is necessary, thinning is usually preferred instead of total removal. This can be accomplished by chemical, mechanical or closely monitored burning.

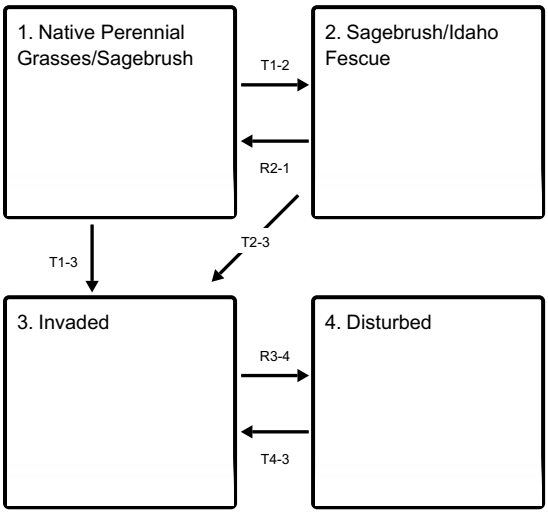
The upper foothills landscape holds snowpack longer, especilly in depressional areas, north aspects and along the edge of timbered areas. These locations can have a significant influence from the slower melt off of the snowpack and will have a dominant community of shrubby cinquefoil and tufted hairgrass. Although many of these locations will key to Clayey Overflow, but this may not be the most appropriate correlation. Consider looking at a Wet Meadow or Lowland ecological site.

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 or high intensity herbivory (continuous season-long grazing) and prolonged drought removes native grasses and lack of fire allows sagebrush to become dominant in the community.

T1-3 - Drought stress, fire, mechanical disturbance including grazing impacts and recreation provide opportunity for introduced and invasive species to establish.

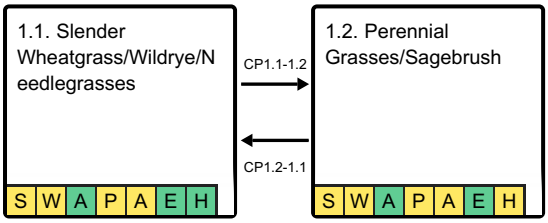
R2-1 - Treatment to thin the canopy followed by prescribed grazing and time allow herbaceous species to increase in the sagebrush canopy.

T2-3 - Prolong Drought stress, long-term continuous season-long grazing, fire, brush control, or other ground disturbances allow the community to be invaded.

R3-4 - Integrated pest management plan and intense weed control with seeding of desired species is required to reclaim this community.

T4-3 - Post-treatment disturbances or failure to change management, shifts the community to an invaded state.

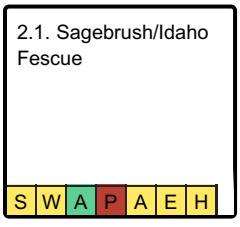
State 1 submodel, plant communities



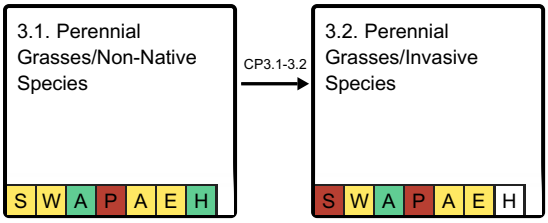
CP1.1-1.2 - Historic grazing, drought, and climatic shifts have attributed to the decline in wildrye and needlegrasses in this community.

CP1.2-1.1 - Prescribed grazing include rest and rotation will assist in recovery of this site.

State 2 submodel, plant communities

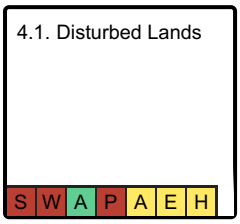


State 3 submodel, plant communities



CP3.1-3.2 - Wildfire and frequent and severe grazing (continuous season-long), will convert the plant community to the Invasive Plant Community.

State 4 submodel, plant communities



State 1
Native Perennial Grasses/Sagebrush

Figure 7. Clayey Overflow reference community two years post fire.

This state evolved with moderate grazing pressure from wildlife (large ungulates such as elk and deer). As areas were settled sheep were the prominent domestic grazers on these landscapes, but have since shifted to mainly cattle with only a few bands of sheep still utilizing these summer pastures. Fire had a role in this system. Although not frequent, these fires helped to manage the health and cover of the woody vegetation in these communities.

Characteristics and indicators. A dominance of native perennial tall and mid-stature cool-season grasses, both bunchgrasses and rhizomatous, is a key indicator of this state, with a healthy cover of mountain big sagebrush, silver sagebrush and rubber rabbitbrush. Snowberry is common as well with a mixture of forbs. Basin wildrye is the key species for the Reference Community. Once basin wildrye begins to decline and mountain big sagebrush becomes the dominant component in this community the state is beginning to transition.

Resilience management. This state is relatively resilient, with species adapted to the fluctuating climatic conditions of the upper foothills. Once the herbaceous understory is compromised and the woody cover begins to increase, the resistance to change is lowered and the State is at-risk.

Dominant plant species

- Douglas-fir (*Pseudotsuga menziesii*), tree
- mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*), shrub
- silver sagebrush (*Artemisia cana*), shrub
- snowberry (*Symphoricarpos*), shrub

- rubber rabbitbrush (*Ericameria nauseosa*), shrub
- slender wheatgrass (*Elymus trachycaulus*), grass
- basin wildrye (*Leymus cinereus*), grass
- Columbia needlegrass (*Achnatherum nelsonii*), grass
- Idaho fescue (*Festuca idahoensis*), grass
- arrowleaf balsamroot (*Balsamorhiza sagittata*), other herbaceous
- silvery lupine (*Lupinus argenteus*), other herbaceous
- Indian paintbrush (*Castilleja*), other herbaceous
- hawksbeard (*Crepis*), other herbaceous

Community 1.1
Slender Wheatgrass/Wildrye/Needlegrasses

This plant community is the interpretive plant community for this site and is considered to be the Reference Plant Community. This state evolved with grazing by large herbivores, additional overflow moisture, and periodic fires. The cyclical natural of the fire regime in this community prevented 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 occasional short periods of rest. The potential vegetation is about 75% grasses or grass-like plants, 15% forbs, and 10% woody plants. Cool season tall and mid-grasses dominate this state. The major grasses include slender wheatgrass and other rhizomatous wheatgrasses, columbia and letterman's needlegrass, and basin wildrye. Other grasses occurring in this state include idaho fescue, spike fescue, mountain brome, prairie junegrass, and Cusick's bluegrass and Canby bluegrasses. Mountain big sagebrush, silver sagebrush, rubber rabbitbrush, and snowberry are conspicuous elements of this state and occur in a mosaic pattern. 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 2,000 lbs./acre, but it can range from about 1250 lbs./acre in unfavorable years to about 2,500 lbs./acre in above average years.

Resilience management. This plant community is stable and well adapted to the Upper Foothills climatic conditions. The diversity in plant species allows for the highly variable climate of the Upper Foothills. This is a sustainable plant community (site/soil stability, watershed function, and biologic integrity).

Dominant plant species

- Douglas-fir (*Pseudotsuga menziesii*), tree
- mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*), shrub
- silver sagebrush (*Artemisia cana*), shrub
- snowberry (*Symphoricarpos*), shrub
- slender wheatgrass (*Elymus trachycaulus*), grass
- Columbia needlegrass (*Achnatherum nelsonii*), grass
- basin wildrye (*Leymus cinereus*), grass
- silvery lupine (*Lupinus argenteus*), other herbaceous
- arrowleaf balsamroot (*Balsamorhiza sagittata*), other herbaceous
- Indian paintbrush (*Castilleja*), other herbaceous

Dominant resource concerns

- Compaction
- Aggregate instability
- Drifted Snow
- Plant productivity and health
- Plant structure and composition
- Inadequate livestock shelter
- Inadequate livestock water quantity, quality, and distribution

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1121	1569	1793
Shrub/Vine	224	560	841
Forb	56	112	168
Total	**1401**	**2241**	**2802**

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	0-10%
Litter	20-30%
Surface fragments >0.25" and <=3"	0-20%
Surface fragments >3"	0-15%
Bedrock	0%
Water	0%
Bare ground	0-10%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-2%	0-10%	0-2%
>0.15 <= 0.3	–	0-5%	0-20%	0-10%
>0.3 <= 0.6	–	0-10%	0-30%	0-5%
>0.6 <= 1.4	–	0-5%	0-10%	0-2%
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

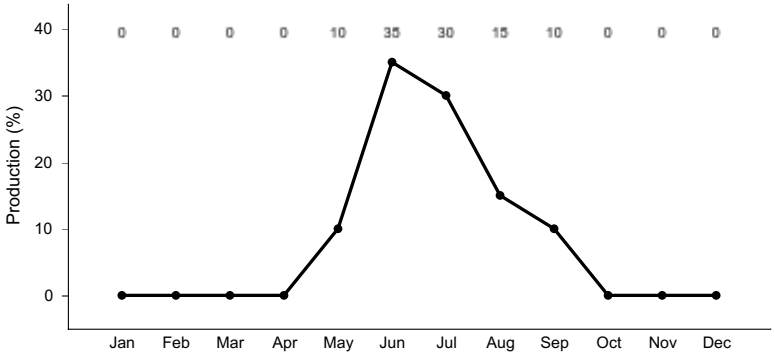


Figure 9. Plant community growth curve (percent production by month). WY0602, 15-19E Extra water sites - LL, Ov, CyO, SL.

Community 1.2
Perennial Grasses/Sagebrush

Historically, this plant community evolved under grazing and a low fire frequency. Currently, it is found under moderate, season-long grazing by livestock and will be exacerbated by wildlife use and prolonged drought conditions. In addition, the fire regime for this site has been modified and extended periods without fire is now common. This plant community is still dominated by cool-season grasses, rhizomatous wheatgrasses, Idaoh fescue, and miscellaneous forbs account for the balance of the understory. Mountain big sagebrush is now a conspicuous part of the overall production and accounts for the majority of the overstory. The dominant grasses include rhizomatous wheatgrasses, Idaho fescue, letterman's needlegrass, and bluegrasses. Grasses and grass-like species of secondary importance include prairie junegrass, needleleaf and threadleaf sedge. Forbs commonly found in this plant community include lupine, scarlet paintbrush, little larkspur, hawksbeard, and phlox. Mountain big sagebrush along with possibly silver sagebrush and rubber rabbitbrush can make up to 20% of the annual production. The overstory of shrubs and understory of grass and forbs provide a diverse plant community. When compared to the Reference Plant Community, big sagebrush and rhizomatous wheatgrasses have increased. Basin wildrye and Columbia needlegrass have decreased and may occur in only trace amounts under the woody canopy. Total production has decreased, but the increase of shrubs has offset some of this loss. The total annual production (air-dry weight) of this state is about 1750 pounds per acre, but it can range from about 1250 lbs./acre in unfavorable years to about 2750 lbs./acre in above average years.

Resilience management. This plant community is resistant to change. The herbaceous species present are 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

- Douglas-fir (*Pseudotsuga menziesii*), tree
- mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*), shrub
- rubber rabbitbrush (*Ericameria nauseosa*), shrub
- snowberry (*Symphoricarpos*), shrub
- Montana wheatgrass (*Elymus albicans*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- Idaho fescue (*Festuca idahoensis*), grass
- Letterman's needlegrass (*Achnatherum lettermanii*), grass
- arrowleaf balsamroot (*Balsamorhiza sagittata*), other herbaceous
- rosy pussytoes (*Antennaria rosea*), other herbaceous
- phlox (*Phlox*), other herbaceous
- silvery lupine (*Lupinus argenteus*), other herbaceous

Dominant resource concerns

- Ephemeral gully erosion
- Compaction
- Aggregate instability
- Drifted Snow
- Plant productivity and health
- Plant structure and composition
- Terrestrial habitat for wildlife and invertebrates
- Inadequate livestock water quantity, quality, and distribution

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	785	1121	1513
Shrub/Vine	560	729	1401
Forb	56	112	168
Total	**1401**	**1962**	**3082**

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	0-10%
Litter	15-30%
Surface fragments >0.25" and <=3"	0-20%
Surface fragments >3"	0-15%
Bedrock	0%
Water	0%
Bare ground	10-15%

Table 10. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-5%	0-10%	0-5%
>0.15 <= 0.3	–	0-10%	0-30%	0-10%
>0.3 <= 0.6	–	0-20%	0-20%	0-2%
>0.6 <= 1.4	–	0-5%	0-5%	0-2%
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Pathway CP1.1-1.2
Community 1.1 to 1.2

Timing of grazing, Dought, Climatic shifts – Location of this LRU places this site where historically, the area was grazed in combination with the US Forest Service summer grazing allotments. Areas tend to be utilized hardest in late spring and early fall as the cattle are preparing to move up and to return from the higher elevation grazing lands. The repetitive season-long use of sensitive species, specifically wildrye and needlegrasss, would have slowly removed these species from the system. Long periods of drought and shifts in spring melt have weakened and impacted the productivity and vigor of most species, leaving a hostile climate for native species to establish. Although the species of herbivory and timing has changed with the installation of more grazing management, pressure from large ungulates, namely elk, have had an impact on the foothills as they follow the available feed sources.

Pathway CP1.2-1.1
Community 1.2 to 1.1

Prescribed grazing will assist with the recovery of this plant community to Reference. The probability of this occurring is high especially if rotation with short deferred is implemented as part of the prescribed method of use. Allowance for natural fire patterns to occur will aid in sagebrush health, but does add to the complexity of grazing management. Upland wildlife habitat management is also key to allow the rest needed for this site to recover.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing
Integrated Pest Management (IPM)
Upland Wildlife Habitat Management

State 2
Sagebrush/Idaho Fescue

Continuous grazing pressure and lack of fire in this system allows the shrub cover to dominate the community while the herbaceous understory is reduced. Herbivory pressure is a combination of wildlife use as well as the historical season-long use by sheep and cattle. Increased predation pressures, shifts in climate, and increased human activity are a few of the reasons that have been listed for the cause of increased elk herds and deer use on the upper foothills zone for longer periods of time, or more frequent use. This increased use with continued frequent and severe use by cattle have compromised this system.

Characteristics and indicators. The dominant cover in this State is mountain big sagebrush with limited herbaceous understory. The forb component has shifted to lower stature forbs and has increased in composition, while the grass and grass-like cover has declined in stature, percent cover, and composition. The major grass cover is Idaho fescue, bluegrasses, and rhizomatous wheatgrasses.

Resilience management. The increased bare ground and reduced vigor of the herbaceous component of this State, puts the community at high risk of transitioning to a further degraded state. The increased woody cover elevates the risk of and changes the behavior of fire in the system.

Dominant plant species

- Douglas-fir (*Pseudotsuga menziesii*), tree
- Rocky Mountain juniper (*Juniperus scopulorum*), tree
- mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*), shrub
- rubber rabbitbrush (*Ericameria nauseosa*), shrub
- Woods' rose (*Rosa woodsii*), shrub
- Idaho fescue (*Festuca idahoensis*), grass
- Montana wheatgrass (*Elymus albicans*), grass
- Sandberg bluegrass (*Poa secunda*), grass
- rosy pussytoes (*Antennaria rosea*), other herbaceous
- phlox (*Phlox*), other herbaceous
- field chickweed (*Cerastium arvense*), other herbaceous

Community 2.1
Sagebrush/Idaho Fescue

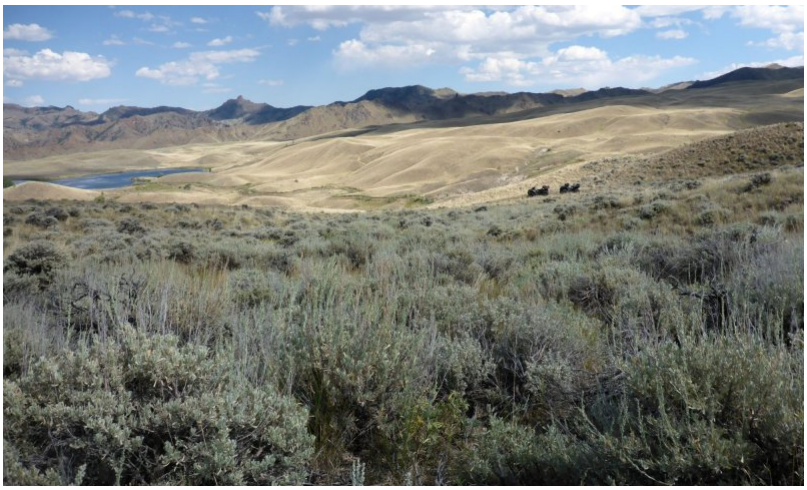


Figure 11. Sagebrush dominated Clayey Overflow ecological site.

This plant community is the result of frequent and severe (continuous season-long) grazing and protection from fire. This improper grazing has negatively affected the tall and some of the mid perennial grasses. Most of the preferred cool season grasses have been reduced or removed from the community. Shrubs, specifically mountain big sagebrush and rubber rabbitbrush, account for up to about one-third of the total production of this plant community. The dominant grasses are rhizomatous wheatgrasses, prairie junegrass, Sandberg bluegrass, threadleaf sedge, and blue grama. Weedy annual species such as cheatgrass may occur in patches if a seed source is available. Cactus and sageworts often increase. The interspaces between plants have expanded leaving the amount of bare ground more prevalent. As compared with the HCPC or the Perennial Grass/Big Sagebrush Plant Communities, the annual production is less, but the increase in shrub and rhizomatous wheatgrass production compensates for some of the loss of the tall and mid perennial production. The total annual production (air-dry weight) of this state is about 1750 pounds per acre, but it can range from about 1200 lbs./acre in unfavorable years to about 3000 lbs./acre in above average years. These figures are estimates based on a low number of ocular inventories and will change with further data collection.

Resilience management. This plant community is relatively resistant to change as the stand becomes more decadent, although continued improper grazing can eventually lead to the reduction in the Idaho fescue and rhizomatous wheatgrasses and increase the dominance of shrubs. These areas may actually become more resistant to fire as less fine fuels are available and the bare ground between the sagebrush plants is increased. Plant diversity is moderate. The plant vigor is diminished and replacement capabilities are limited due to the reduced number of cool-season grasses. Plant litter is noticeably less when compared to the Reference. Soil erosion is accelerated because of increased bare ground. Water flow patterns and pedestalling are forming. 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

- Douglas-fir (*Pseudotsuga menziesii*), tree
- Rocky Mountain juniper (*Juniperus scopulorum*), tree
- mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*), shrub
- rubber rabbitbrush (*Ericameria nauseosa*), shrub
- Woods' rose (*Rosa woodsii*), shrub
- Idaho fescue (*Festuca idahoensis*), grass
- Montana wheatgrass (*Elymus albicans*), grass
- muttongrass (*Poa fendleriana*), grass
- rosy pussytoes (*Antennaria rosea*), other herbaceous
- phlox (*Phlox*), other herbaceous
- field chickweed (*Cerastium arvense*), other herbaceous

Dominant resource concerns

- Sheet and rill erosion
- Ephemeral gully erosion
- Compaction

- Aggregate instability
- Drifted Snow
- 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 shelter
- Inadequate livestock water quantity, quality, and distribution

Table 11. 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	0-10%
Litter	20-30%
Surface fragments >0.25" and <=3"	0-20%
Surface fragments >3"	0-15%
Bedrock	0%
Water	0%
Bare ground	15-30%

Table 12. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-5%	0-20%	0-10%
>0.15 <= 0.3	–	0-20%	0-25%	0-5%
>0.3 <= 0.6	–	0-15%	0-10%	0-2%
>0.6 <= 1.4	–	0-5%	0-5%	0-2%
>1.4 <= 4	0-15%	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

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, timothy, redtop bent, or smooth brome for non-native invaders; or cheatgrass for invasive species. Thistle and common dandelion are other species of concern on this ecological site.

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

Dominant plant species

- Douglas-fir (*Pseudotsuga menziesii*), tree
- Rocky Mountain juniper (*Juniperus scopulorum*), tree
- mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*), shrub
- rubber rabbitbrush (*Ericameria nauseosa*), shrub
- Woods' rose (*Rosa woodsii*), shrub
- Kentucky bluegrass (*Poa pratensis*), grass
- Idaho fescue (*Festuca idahoensis*), grass
- cheatgrass (*Bromus tectorum*), grass
- timothy (*Phleum pratense*), grass
- field chickweed (*Cerastium arvense*), other herbaceous
- rosy pussytoes (*Antennaria rosea*), other herbaceous
- common dandelion (*Taraxacum officinale*), other herbaceous
- phlox (*Phlox*), other herbaceous

Community 3.1
Perennial Grasses/Non-Native Species

Figure 12. Clayey Overflow site that has a prominent cover of timothy.

Figure 13. Snow seep sites are difficult and will key to Clayey overflow, but in this instance, the dominant cover of timothy and shrubby cinquefoil suggest a perched water table, so not a clayey overflow site.

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 (ten percent or greater by foliar cover or five 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 Kentucky bluegrass, timothy, and common dandelion. However, smooth brome and redtop bent are also frequent components.

Resilience management. 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
- Douglas-fir (*Pseudotsuga menziesii*), tree
- mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*), shrub
- rubber rabbitbrush (*Ericameria nauseosa*), shrub
- Woods' rose (*Rosa woodsii*), shrub
- Kentucky bluegrass (*Poa pratensis*), grass
- timothy (*Phleum pratense*), grass
- Idaho fescue (*Festuca idahoensis*), grass
- smooth brome (*Bromus inermis*), grass
- field chickweed (*Cerastium arvense*), other herbaceous
- rosy pussytoes (*Antennaria rosea*), other herbaceous
- phlox (*Phlox*), other herbaceous
- common dandelion (*Taraxacum officinale*), other herbaceous

Dominant resource concerns

- Compaction
- Aggregate instability
- Drifted Snow
- Plant productivity and health
- 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 non-native species, as well as Idaho fescue 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). Wood's rose, 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, Idaho fescue and bluegrass will persist on the site (bluegrass includes natives: Sandberg, mutton, Canby, and big; as well as introduced species: Kentucky). Timothy, 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. This plant community is resistant to continued herbivory. Annuals and invader species 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 low. The biotic integrity is missing. The state is unstable and is not protected from excessive erosion. Rill channels and 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

- rubber rabbitbrush (*Ericameria nauseosa*), shrub
- Woods' rose (*Rosa woodsii*), shrub
- snowberry (*Symphoricarpos*), shrub
- cheatgrass (*Bromus tectorum*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- timothy (*Phleum*), grass
- smooth brome (*Bromus inermis*), grass
- field chickweed (*Cerastium arvense*), other herbaceous
- rosy pussytoes (*Antennaria rosea*), other herbaceous
- phlox (*Phlox*), other herbaceous
- common dandelion (*Taraxacum officinale*), other herbaceous

Dominant resource concerns

- Sheet and rill erosion
- Ephemeral gully erosion
- Compaction
- Aggregate instability
- Naturally available moisture use
- 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 shelter
- Inadequate livestock water quantity, quality, and distribution

Pathway CP3.1-3.2
Community 3.1 to 3.2

State 4
Disturbed

Although to a much smaller extent than in lower elevations, there are areas that have been accessed for irrigation convenience ditches or were part of a homestead. These areas have remnants of introduced species for haylands or have been left to recover and may be in at varying stages of succession. Or there are areas that are heavily impacted by recreational vehicles, parking, trails, roadways, or other land disturbances that have reduced or removed most native perennial vegetation and left a highly disturbed land. 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, or chemical), the site potential is altered. The most prominent shift for this site tends to be a shift in the natural hydrology that is key to this site. This can include both the loss of or enhancement to the additional moisture to the site (seepage from irrigation ditches). 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 these communities is a potential threat; and the communities are 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 soils were once cultivated or were impacted by cultivation pracites and have since been left to natural processes. Homestead and abandoned farming sites can be identified on the landscape (through photo-tone shifts in aerial photographs) and are generally a mix of natives and introduced herbaceous species as well as trees. Cottonwood breaks, elm, and other species of trees on these sites are key markers of old homestead locations. These sites are generally isolated or small in nature and are difficult to reclaim due to the introduced species that persist on the landscape and the shift in hydrology. If reclaimed, they do not respond to the natural disturbance regimes in the same manner that a native, mechanically undisturbed site would respond. The Clayey Overflow ecological site was incidental to disturbance by homesteading or irrigation processes. The extent of this type is limited on the landscape. 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 level and age of disturbance at each location leave a variable community. In a similar process, mined lands or lands affected by energy development including 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. 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 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 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
- Organic matter depletion
- Aggregate instability
- Seeps
- Drifted Snow
- 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

Many of these higher elevation communities are used for season or year-long grazing by cattle, sheep, or other livestock. Elk, deer, moose, and other wildlife also utilize these areas intensively throughout the year (specifically spring and fall). This frequent or high intensity herbivory weakens the ability for native grasses to persist in the community, and will begin to decline over time. Prolonged drought or unusually early warm temperatures over time dry the soils out impacting the grasses even harder. Lack of fire in this system allows sagebrush to become the majority of the composition in the community. Fire does not occur frequently, but has a shorter return interval than the lower elevation sagebrush communities.

Constraints to recovery. Rest or time for the native herbaceous species to recover as well as the necessary nursery source for these species are the major limitations to recovery for this community.

Transition T1-3
State 1 to 3

Seed sources are abundant for many non-native and invasive species. Drought stress, wildfire or prescribed burning and associated activities, and brush control provide opportunity and many times the seed source for invasion. Ground and soil disturbances by human activities are a primary source for seeds. However, wildlife are a major transporter of many seeds. These impacts by grazing large herbivores and the vehicular impacts including recreation create the niche for establishment while providing the seed source for an array of non-native and invasive species to invade.

Constraints to recovery. Once most introduced or invasive species establish, it is extremely difficult to control or remove these species from the system. Many times the cost effectiveness of wide scale treatment hinders the ability for many landowners from trying.

Restoration pathway R2-1
State 2 to 1

Treatment to thin the sagebrush canopy improves the sun exposure and moisture available to the herbaceous native vegetation. Complete removal of the sagebrush canopy may slow the recovery time and provides opportunity for negative shifts in the community, but it can be an effective means to recovery. Following canopy treatment, prescribed grazing to prevent damage to the grasses as they are re-establishing and to prevent damage to the shrub canopy, is required. The tools used to thin the canopy will vary depending on the exact composition of grasses remaining and the potential threats to the location.

Conservation practices

Brush Management
Prescribed Burning
Critical Area Planting
Prescribed Grazing
Heavy Use Area Protection
Recreation Area Improvement
Integrated Pest Management (IPM)
Upland Wildlife Habitat Management

Transition T2-3
State 2 to 3

Seed sources are abundant for cheatgrass, knapweed, and other invasive species. Drought stress, wildfire or prescribed burning, brush control, or ground/soil disturbance including impacts by grazing large herbivores or recreation create a niche for undesirable weeds to invade.

Constraints to recovery. The common invasive and introduced species are difficult to control or maintain, and the

ability to eradicate these species from the system has not been successful. This challenge to removing these species is the constraint to recovery for these communities.

Restoration pathway R3-4
State 3 to 4

A long-term Integrated pest management plan that includes both pre- and post-treatment intense weed control is necessary to overcome a severe weed infestation. The treatment for this community is a seeding treatment following extensive seedbed preparation. Selecting herbaceous species that are adapted to the location and using either improved varieties, native seed, or in some cases an introduced species suited for the management use intended may be the only way to overcome some invasive species. A grazing management plant to incorporate rest into the system and rotation of use is needed to further allow recovery.

Conservation practices

Brush Management
Prescribed Burning
Critical Area Planting
Grazing Land Mechanical Treatment
Range Planting
Heavy Use Area Protection
Recreation Area Improvement
Integrated Pest Management (IPM)
Restoration and Management of Rare and Declining Habitats
Upland Wildlife Habitat Management

Transition T4-3
State 4 to 3

Following reclamation or restoration practices, the community is sensative to further disturbance or to climatic influences. Seeding failure or weed control failures promote rapid transitions back to the Invaded State. Further land disturbances or failure to change management of the lands are other means for this transition to occur. Wildfire, prescribed burning, drought, or frequent and severe grazing by large herbivores are a source disturbance.

Constraints to recovery. The inability to control climatic factors, the challenge of controlling invasive species, and the aversion to changing management practices and financial limitations are the major constraints to recovery for this community.

Additional community tables

Table 13. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall-stature, Cool-season Grasses**			308–1121	
	basin wildrye	LECI4	*Leymus cinereus*	280–560	10–25
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	84–336	5–15
	mountain brome	BRMA4	*Bromus marginatus*	0–224	0–10
	nodding brome	BRAN	*Bromus anomalus*	0–84	0–5
2	**Mid-stature, Cool-season Bunchgrasses**			56–280	
	Idaho fescue	FEID	*Festuca idahoensis*	0–196	0–10
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–84	0–5

	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–84	0–5
	Cusick's bluegrass	POCU3	*Poa cusickii*	0–56	0–5
3	**Rhizomatous, Cool-season Grasses**			224–560	
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	224–504	10–25
	Montana wheatgrass	ELAL7	*Elymus albicans*	0–196	0–10
	western wheatgrass	PASM	*Pascopyrum smithii*	0–196	0–10
4	**Miscellaneous Grasses/Grass-likes**			0–196	
	muttongrass	POFE	*Poa fendleriana*	0–84	0–5
	Sandberg bluegrass	POSE	*Poa secunda*	0–84	0–5
	squirreltail	ELEL5	*Elymus elymoides*	0–84	0–5
	spike trisetum	TRSP2	*Trisetum spicatum*	0–84	0–5
	timber oatgrass	DAIN	*Danthonia intermedia*	0–84	0–5
	Grass, perennial	2GP	*Grass, perennial*	0–84	0–5
Forb					
5	**Perennial Forbs**			56–224	
	lupine	LUPIN	*Lupinus*	0–84	0–5
	buttercup	RANUN	*Ranunculus*	0–84	0–5
	fleabane	ERIGE2	*Erigeron*	0–84	0–5
	phlox	PHLOX	*Phlox*	0–84	0–5
	beardtongue	PENST	*Penstemon*	0–84	0–5
	goldenrod	SOLID	*Solidago*	0–84	0–5
	groundsel	TEPHR3	*Tephroseris*	0–84	0–5
	Forb, perennial	2FP	*Forb, perennial*	0–84	0–5
Shrub/Vine					
6	**Dominant Shrubs**			280–560	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	112–336	5–15
	silver sagebrush	ARCA13	*Artemisia cana*	0–112	0–5
	western snowberry	SYOC	*Symphoricarpos occidentalis*	0–112	0–5
7	**Miscellaneous Shrubs**			0–280	
	chokecherry	PRVI	*Prunus virginiana*	0–84	0–5
	Saskatoon serviceberry	AMAL2	*Amelanchier alnifolia*	0–84	0–5
	Woods' rose	ROWO	*Rosa woodsii*	0–84	0–5
	currant	RIBES	*Ribes*	0–84	0–5
	snowbrush ceanothus	CEVE	*Ceanothus velutinus*	0–84	0–5
	Shrub, other	2S	*Shrub, other*	0–84	0–5

Animal community

Animal Community – Wildlife Interpretations

Rhizomatous Wheatgrass/Green Needlegrass (Refernce): The predominance of grasses in this plant community favors grazers and mixed-feeders, such as bison, elk, deer, 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. 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 meadowlarks, horned larks, and golden eagles. Many grassland obligate small mammals would

occur here.

Perennial Grasses/Big Sagebrush Plant Community: The combination of an overstory of shrubs and an understory of grasses and forbs plus it proximity to water 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 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.

Big Sagebrush/Rhizomatous Wheatgrass Plant Community: The combination of an overstory of shrubs and an understory of grasses and forbs plus it proximity 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 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.

Dense Shrub/Bare Ground 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 excellent escape and thermal cover for large ungulates, as well as nesting habitat for upland game birds including sage grouse.

Weedy Annuals/Short Grass Plant Community:
These communities provide limited foraging for antelope and other grazers. They may be used as a foraging site by sage grouse if proximal to woody cover and if the Historic Climax Plant Community or the Perennial Grasses/ Big Sagebrush Plant Community is limiting. 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 with 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*

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

Plant Community Description/Title	Lbs./Acre Below Ave. Normal Above Ave.	AUM/Acre*	Acre/AUM
Slender Wheatgrass/Wildrye/Needlegrass	1250-2000-2500	0.55	1.83
Perennial Grass/Big Sagebrush	1250-1750-2750	0.48	2.09
Big Sagebrush/Rhizomatous Wheatgrasses	**	**	
Introduced Species/Big Sagebrush	**	**	
Invasive Species/Big Sagebrush	**	**	
Altered	**	**	

* - Carrying Capacity is figured for continuous, season-long grazing by cattle under average growing conditions.
** - Sufficient data for invaded and reclaimed communities has not be collected or evaluated, at this time, so no projection of a stocking rate recommendation or production range will be established at this time.

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide yearlong forage for cattle, sheep, or horses. During the dormant period, the forage for livestock use needs to be supplemented with protein because the quality does not meet minimum livestock requirements.

Distance to water, shrub density, and slope can affect carrying capacity (grazing capacity) within a management unit. Adjustments should be made for the area that is considered necessary for reduction of animal numbers. For example, 30% of a management unit may have 25% slopes and distances of greater than one mile from water; therefore, the adjustment is only calculated for 30% of the unit (i.e. 50% reduction on 30% of the management unit).

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 moderate depending on soil hydrologic group and ground cover. In many cases, areas with greater than 75% ground cover have the greatest potential for high infiltration and lower runoff. 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).

Rills and gullies should not typically be present. Water flow patterns should be barely distinguishable if at all present. Pedestals are only slightly present in association with bunchgrasses. Litter typically falls in place, and signs of movement are not common. Chemical and physical crusts are rare to non-existent. Cryptogamic crusts are present, but only cover 1-2% of the soil surface.

Recreational uses

This site provides hunting opportunities for upland game species. The wide varieties of plants which bloom from spring until fall have an aesthetic value that appeals to visitors.

Wood products

No appreciable wood products are present on the site.

Other products

The Clayey Overflow ecological site is generally small in nature; however, the area will support fruit-bearing shrubs that are harvested for using for seeping (teas/herbal drinks) and baked goods (jams, jellies, etc.).

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 developing the Loamy range site include: Chris Krassin, Range Management Specialist, NRCS and Everet Bainter, Range Management Specialist. 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.

Those involved in the development of the new concept for Loamy and Loamy Calcareous Ecological site include: Blaise Allen, Area Range Management Specialist, NRCS; Jim Wolf, Resource Manager, USDI-BLM; Patricia Hatle, Range Management Specialist, USDI-BLM; Daniel Wood, MLRA Soil Survey Leader, NRCS; Jane Karinen, Soil Data Quality Specialist, NRCS; and Marji Patz, Ecological Site Specialist, NRCS.

Inventory Data References:
Ocular field estimations observed by trained personnel were completed at each site. Then sites were selected where a 100 foot tape was stretched and the following sample procedures were completed by inventory staff. For full sampling protocol and guidelines with forms please refer to the Wyoming ESI Operating Procedures, compiled in 2012 for the Powell and Rock Springs Soil Survey Office, USDA-NRCS.

• Double Sampling Production Data (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.)

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Contributors

Dan Mattke, Resource Soil Scientist - Rocky Mountain Area Office

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.

Author(s)/participant(s)	Marji Patz
Contact for lead author	marji.patz@usda.gov; 307-271-3130
Date	04/06/2020
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.

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2. **Presence of water flow patterns:** Water flow patterns sometimes evident in ephemeral floodplain zone where this site occurs.

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

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not**

bare ground): Bare ground can range from 5-15%.

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

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

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7. **Amount of litter movement (describe size and distance expected to travel):** Herbaceous litter expected to move in water flow patterns.

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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 2 (interspaces) to 6 (under plant canopy), but average values should be 2.5 or greater.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil data is limited for this site. Described A-horizons vary from 2 to 8 inches (5-20 cm). Organic matter is typically 1 to 2%.

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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 60-75% grasses, 20% forbs, and 5-20% shrubs. Moderate plant canopy (50-70%) and litter plus slow to moderately slow infiltration rates result in slight to moderate runoff. Basal cover is typically around 2-3% for this site and does not effectively reduce 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 exists.

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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: Rhizomatous, Cool-season Grasses < Tall-stature, Cool-season Grasses

    Sub-dominant: Mid-stature, Cool-season Grasses < Perennial Shrubs

    Other: Perennial Forbs << Short-stature, 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 20-40% of total canopy measurement with total

litter (including beneath the plant canopy) from 75-90% expected. Herbaceous litter depth typically ranges from 10-25 mm. Woody litter can be up to several inches (>8 cm).

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Estimated production is 1250-2500 lb/ac (1401 - 2802 kg/ha) with an average of 2000 lb/ac (2242 kg/ha). This is based on few ocular estimations, more data is needed.

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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 40% or noxious weed invasion are the most common indicators of a threshold being crossed. Rhizomatous wheatgrasses, Sandberg bluegrass, and mountain big sagebrush are common increasers. Annual weeds such as mustard and Canada thistle are common invasive species on disturbed sites.

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