USDA Natural Resources Conservation Service

Ecological site R046XN247MT
Clayey (Cy) RRU 46-N 13-19 PZ

Last updated: 7/19/2023
Accessed: 05/05/2024

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.

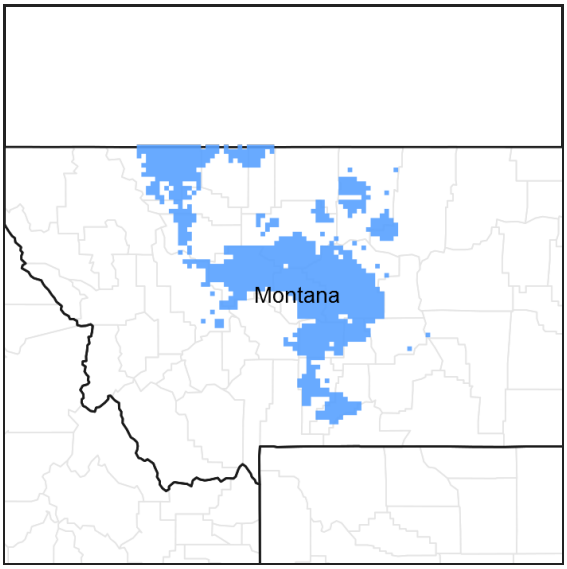


Figure 1. Mapped extent

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

Associated sites

R046XS104MT	**Silty (Si) RRU 46-S 13-19 PZ**
R046XS619MT	**Shallow Clay (SwC) RRU 46-S 13-16 PZ**

Similar sites

R046XS104MT	**Silty (Si) RRU 46-S 13-19 PZ** The Silty site differs mainly by soil texture.
R046XS619MT	**Shallow Clay (SwC) RRU 46-S 13-16 PZ** The Shallow Clay site differs by being 20 inches or less to a root limiting layer, typically clay shales, thus having significantly lower production.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Pseudoroegneria spicata* (2) *Festuca idahoensis*

Physiographic features

Table 2. Representative physiographic features

Landforms	(1) Plain (2) Fan (3) Terrace
Flooding frequency	None
Ponding frequency	None
Slope	0–15%
Water table depth	152 cm
Aspect	Aspect is not a significant factor

Climatic features

See Climatic Data Sheet for more details (Section II of the Field Office Technical Guide) or reference the following climatic web site: http://www.wrcc.sage.dri.edu/.

Table 3. Representative climatic features

Frost-free period (characteristic range)	57-84 days
Freeze-free period (characteristic range)	109-120 days
Precipitation total (characteristic range)	381-432 mm
Frost-free period (actual range)	37-90 days
Freeze-free period (actual range)	101-122 days
Precipitation total (actual range)	356-432 mm
Frost-free period (average)	69 days
Freeze-free period (average)	114 days
Precipitation total (average)	406 mm

Climate stations used

- (1) BABB 6 NE [USC00240392], Babb, MT
- (2) AUGUSTA [USC00240364], Augusta, MT
- (3) CASCADE 5 S [USC00241552], Cascade, MT
- (4) ROGERS PASS 9 NNE [USC00247159], Wolf Creek, MT

Influencing water features

Soil features

These soils are typically clay loam, silty clay loam, silty clay, sandy clay, and clays that are more than 20 inches deep. There are no significant limitations to plant growth. Available Water Holding Capacity to a 40 inch depth is mostly about 7.5 inches.

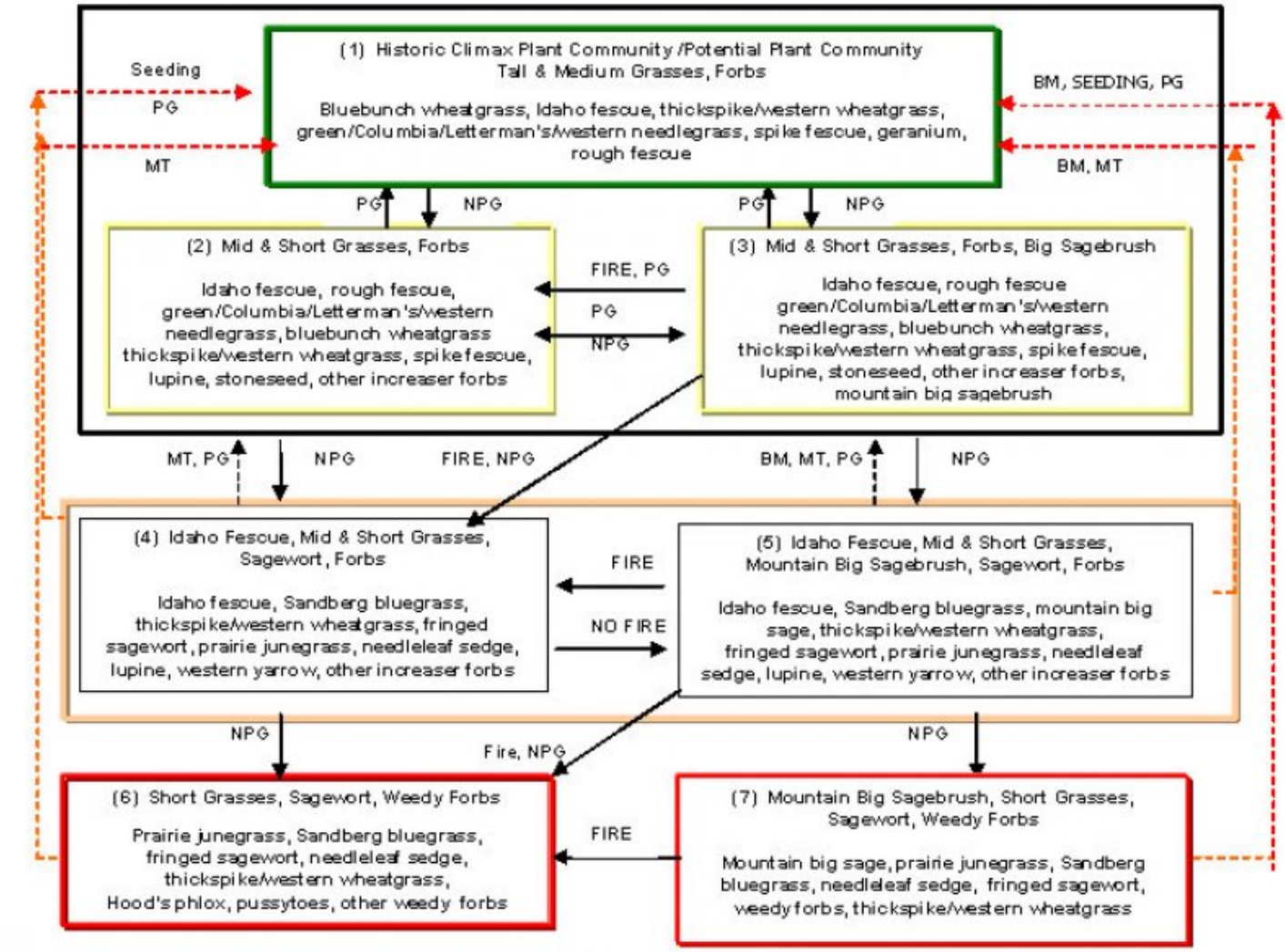
Table 4. Representative soil features

Surface texture	(1) Clay loam (2) Silty clay loam (3) Silty clay
Soil depth	51 cm

Available water capacity (0-101.6cm)	19.05 cm

Ecological dynamics

State and transition model



Smaller boxes within a larger box indicate that these communities will normally shift among themselves with slight variations in precipitation and other disturbances. Moving outside the larger box indicates the community has crossed a threshold (heavier line) and will require intensive treatment to return to Community 1 or 2. Dotted lines indicate a reduced probability for success. Yellow boxes indicate caution that the community may be in danger of crossing a threshold. Orange boxes represent communities that have crossed over thresholds from the HCPC and may be difficult to restore with grazing management alone. Red boxes represent communities that have severely shifted away from the HCPC and probably cannot be restored without mechanical inputs.

NOTE: Not all species present in the community are listed in this table. Species listed are representative of the plant functional groups that occur in the community.

PG = Prescribed Grazing: Use of a planned grazing strategy to balance animal forage demand with available forage resources. Timing, duration, and frequency of grazing are controlled and some type of grazing rotation is applied to allow for plant recovery following grazing.

NPG = Non-Prescribed Grazing: Grazing which has taken place that does not control the factors as listed above, or animal forage demand is more than the available forage supply.

Fire: Prescribed fire or non-prescribed wildfire.
MT = Mechanical Treatment (e.g., chiseling)

Figure 8. State and Transition Model

State 1
Tall and Medium Grasses, Forbs

Community 1.1

Tall and Medium Grasses, Forbs

This is the interpretive plant community and is considered to be the Historic Climax Plant Community for this site. This plant community contains a high diversity of tall and medium height, cool season grasses (bluebunch wheatgrass, Idaho fescue, thickspike/western wheatgrass, spike fescue, green/Columbia/Letterman's/western needlegrass), and short grasses (Cusick and Sandberg bluegrass, spike oatgrass, and prairie junegrass). There are abundant forbs (geranium, prairie clovers) which occur in smaller percentages. This plant community is well adapted to the Northern Rocky Mountain Foothills climatic conditions. The diversity in plant species allows for drought tolerance. Individual species can vary greatly in production depending on growing conditions (timing and amount of precipitation, and temperature). This plant community is well suited to managed livestock grazing and provides diverse habitat for many wildlife species. These plants have strong, healthy root systems that allow production to increase significantly with favorable moisture conditions. This plant community provides for soil stability and a properly functioning hydrologic cycle. Abundant plant litter is available for soil building and moisture retention. Plant litter is properly distributed with very little movement off-site and natural plant mortality is very low. The soils associated with this site provide a very favorable soil-water-plant relationship.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1130	1459	1852
Forb	242	365	529
Shrub/Vine	242	313	397
Total	**1614**	**2137**	**2778**

State 2
Medium and Short Grasses, Forbs

Community 2.1
Medium and Short Grasses, Forbs

Early stages of degradation, including non-prescribed grazing, result in a plant community composition having more medium and short increaser grasses such as Idaho fescue, thickspike/western wheatgrass, Cusick and Sandberg bluegrass, spike oatgrass, and prairie junegrass. Most of the taller, more palatable grasses (bluebunch wheatgrass, tall needlegrasses, spike fescue) will still be common but in smaller amounts. Palatable and nutritious forbs will begin to be replaced by less desirable and more aggressive species such as lupine and stoneseed. Grass biomass production and litter become reduced on this site with Community 2. Evaporation increases, moisture retention decreases, and soil surface temperatures increase as the taller grasses are replaced. Some of the natural ecological processes will be altered. This plant community provides for moderate soil stability. Increased bare ground in the community provides opportunity for undesirable species to invade.

State 3
Medium and Short Grasses, Forbs, Big Sagebrush

Community 3.1
Medium and Short Grasses, Forbs, Big Sagebrush

A lack of periodic fire (at the approximate historic interval) will tend to change the HCPC to a herbaceous community composition like No. 2, but also having mountain big sagebrush as a minor component. Biomass production and litter become reduced on the site as the taller grasses become replaced by shorter species and mountain big sagebrush. Evapotranspiration tends to increase and moisture retention is reduced. These plant communities provide for moderate soil stability. Some of the natural ecological processes will be altered. Increased bare ground in these communities (2 & 3) can result in undesirable species invading. Common invaders can include leafy spurge, dalmation toadflax, and sulphur cinquefoil. It is critical at this point to consider implementing a change in grazing management to prevent the increase of less desirable species and prevent further degradation to any of the following plant communities. Once any of the following communities become established, the potential to return to communities 1, 2, or 3 become more difficult, requires more time, and often require significant economic inputs.

State 4
Idaho Fescue, Medium and Short Grasses, Sagewort, Forbs

Community 4.1
Idaho Fescue, Medium and Short Grasses, Sagewort, Forbs

With continued heavy disturbance on community 2, the site will become dominated by species such as Idaho fescue, thickspike or western wheatgrass, fringed sagewort, prairie junegrass, blue grama (16” or less MAP), sedges, and perennial forbs such as lupine, western yarrow, prairie smoke and ballhead sandwort. There may still be remnant amounts of some of the late-seral species such as bluebunch wheatgrass and green/Columbia needlegrass present. The taller grasses will occur only occasionally. Palatable forbs will be mostly absent.

State 5
Idaho Fescue, Medium and Short Grasses, Big Sagebrush, Sagewort, Forbs

Community 5.1
Idaho Fescue, Medium and Short Grasses, Big Sagebrush, Sagewort, Forbs

As continued heavy disturbance continues on community 3, it deteriorates to one similar to number 4, except that the mountain big sagebrush is more abundant. This community can also be the result of a lack of periodic fire on community 4. Plant communities 4 and 5 are the result of long-term, heavy, continuous grazing and/or annual, early spring seasonal grazing. Repeated spring grazing depletes stored carbohydrates, resulting in weakening and eventual death of the cool season tall and medium grasses. These plant communities can occur throughout the pasture, on spot grazed areas, and near water sources where season-long grazing patterns occur. These last two plant communities (4 & 5) are less productive than Plant Communities 1, 2, or 3. A reduction in the amount of litter and shorter plant heights result in higher soil surface temperatures, reduced water infiltration rates, and higher evapotranspiration, thus eventually favoring species that are more adapted to drier conditions. These communities have lost many of the attributes of a healthy rangeland, including good infiltration, minimal erosion and runoff, good nutrient cycling and energy flow. Communities 4 and 5 will respond positively to improved grazing management, but significant economic inputs and time are usually required to move these plant communities toward a higher successional stage and a more productive plant community.

State 6
Short Grasses, Sagewort, Weedy Forbs

Community 6.1
Short Grasses, Sagewort, Weedy Forbs

If community 4 deteriorates further due to non-prescribed grazing or other disturbance, it becomes dominated by short grasses (Sandberg bluegrass, and prairie junegrass), fringed sagewort, needleleaf sedge, and weedy forbs (pussytoes, western yarrow, prairie smoke, field chickweed, northern bedstraw and ballhead sandwort). There is often a remnant amount of some of the mid-seral grasses such as thickspike wheatgrass and Idaho fescue, usually widely spaced. Periodic fire, coupled with non prescribed grazing, can also move Community 5 to one similar to 6.

State 7
Big Sagebrush, Short Grasses, Sagewort, Weedy Forbs

Community 7.1
Big Sagebrush, Short Grasses, Sagewort, Weedy Forbs

Further deterioration of community 5 due to lack of periodic fire coupled with non-prescribed grazing or other disturbance leads to a plant community dominated by mountain big sagebrush (% composition???). Short grasses (prairie junegrass, Sandberg bluegrass), needleleaf sedge, fringed sagewort, weedy forbs (field chickweed, pussytoes) and thickspike or western wheatgrass typically comprise the rest of the plant composition. Plant communities 6 and 7 have extremely reduced production of desirable native plants (< 500 lbs./acre). The lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and increased

evaporation, which gives the sagebrush and short grasses and invaders a competitive advantage over the cool season tall and medium grasses. These communities have lost most of the attributes of a healthy rangeland, including good infiltration, minimal erosion and runoff, nutrient cycling and energy flow. Significant economic inputs and time would be required to move these plant communities toward a higher successional stage and a more productive plant community. Often, seeding and/or mechanical treatment practices are needed, along with prescribed grazing, to restore this community.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	**Shrubs and Half-shrubs**			242–397	
	Shrub, broadleaf	2SB	*Shrub, broadleaf*	0–132	–
	silver sagebrush	ARCAV2	*Artemisia cana ssp. viscidula*	0–132	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–132	–
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	0–132	–
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	0–132	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–132	–
Grass/Grasslike					
0	**Grasses and Sedges**			1130–1852	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	336–897	–
	spike fescue	LEKI2	*Leucopoa kingii*	0–529	–
	rough fescue	FECA4	*Festuca campestris*	112–509	–
	Idaho fescue	FEID	*Festuca idahoensis*	81–314	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	81–265	–
	western wheatgrass	PASM	*Pascopyrum smithii*	40–198	–
	tufted wheatgrass	ELMA7	*Elymus macrourus*	40–198	–
	slender wheatgrass	ELTRS	*Elymus trachycaulus ssp. subsecundus*	0–198	–
	slender wheatgrass	ELTRT	*Elymus trachycaulus ssp. trachycaulus*	0–198	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	81–132	–
	Cusick's bluegrass	POCU3	*Poa cusickii*	0–132	–
	oldpasture bluegrass	POSA	*Poa saltuensis*	81–132	–
	Grass, perennial	2GP	*Grass, perennial*	0–132	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–132	–
	mountain brome	BRMA4	*Bromus marginatus*	0–132	–
	needleleaf sedge	CADU6	*Carex duriuscula*	0–132	–
	threadleaf sedge	CAFI	*Carex filifolia*	0–132	–
	plains reedgrass	CAMO	*Calamagrostis montanensis*	0–132	–
	timber oatgrass	DAIN	*Danthonia intermedia*	0–132	–
	poverty oatgrass	DASP2	*Danthonia spicata*	0–132	–
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	20–100	–
	Columbia	ACNEN2	*Achnatherum nelsonii ssp. nelsonii*	20–100	

	Columbia needlegrass	ACNEN2	*Achnatherum nelsonii ssp. nelsonii*	20–100	–
	western needlegrass	ACOCO	*Achnatherum occidentale ssp. occidentale*	20–100	–
	green needlegrass	NAVI4	*Nassella viridula*	20–100	–
Forb					
0	**Forbs**			242–529	
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–132	–
	beardtongue	PENST	*Penstemon*	0–132	–
	spiny phlox	PHHO	*Phlox hoodii*	0–132	–
	scurfpea	PSORA2	*Psoralidium*	0–132	–
	cutleaf anemone	PUPAM	*Pulsatilla patens ssp. multifida*	0–132	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–132	–
	prairie thermopsis	THRH	*Thermopsis rhombifolia*	0–132	–
	American vetch	VIAM	*Vicia americana*	0–132	–
	Forb, perennial	2FP	*Forb, perennial*	0–132	–
	common yarrow	ACMI2	*Achillea millefolium*	0–132	–
	pale agoseris	AGGL	*Agoseris glauca*	0–132	–
	onion	ALLIU	*Allium*	0–132	–
	pussytoes	ANTEN	*Antennaria*	0–132	–
	aster	ASTER	*Aster*	0–132	–
	milkvetch	ASTRA	*Astragalus*	0–132	–
	balsamroot	BALSA	*Balsamorhiza*	0–132	–
	Bonneville shootingstar	DOCO	*Dodecatheon conjugens*	0–132	–
	yellow fritillary	FRPU2	*Fritillaria pudica*	0–132	–
	old man's whiskers	GETR	*Geum triflorum*	0–132	–
	sticky purple geranium	GEVI2	*Geranium viscosissimum*	11–132	–
	common starlily	LEMO4	*Leucocrinum montanum*	0–132	–
	western stoneseed	LIRU4	*Lithospermum ruderale*	0–132	–
	desertparsley	LOMAT	*Lomatium*	0–132	–
	lupine	LUPIN	*Lupinus*	0–1	–
	larkspur	DELPH	*Delphinium*	0–1	–
	deathcamas	ZIGAD	*Zigadenus*	0–1	–

Animal community

Livestock Grazing Interpretations: Managed livestock grazing is suitable on this site as it has the potential to produce an abundance of high quality forage. This is often a preferred site for grazing by livestock, and animals tend to congregate in these areas. In order to maintain the productivity of the Clayey site, grazing on adjoining sites with less production must be managed carefully to be sure utilization on this site is not excessive. Management objectives should include maintenance or improvement of the plant community. Shorter grazing periods and adequate re-growth after grazing are recommended for plant maintenance and recovery. Heavy stocking and season-long use of this site can be detrimental and will alter the plant community composition and production over time.

Whenever Plant Communities 2 or 3 (Medium and short grasses) occur, grazing management strategies need to be implemented to avoid further deterioration. These communities are still stable, productive, and healthy provided they receive proper management. They will respond fairly quickly to improved grazing management, including increased

growing season rest of key forage plants. Grazing management alone can usually move these communities back towards the potential community.

Plant Communities 4 and 5 have substantially reduced forage production, and a high percentage of aggressive, less-desirable species. Once these plant communities become established, it will be much more difficult to restore the site to a community that resembles the potential with grazing management alone. Additional growing season rest is often necessary for re-establishment of the desired species and to restore the stability and health of the site. Reseeding, brush management, and/or mechanical treatment are often needed to restore tall perennial grasses onto this site, especially with Community 5 having a relatively high percentage of big sagebrush.

Plant Communities 6 and 7 have extremely limited forage production (< 500 pounds per acre). They have a high percentage of non desirable forage species. The sagebrush is highly competetive once established, often making seeding necessary to restore desirable native perennial species.

Stocking rates are calculated from average forage production values using a 25% Harvest Efficiency factor for preferred and desirable plants, and 10% Harvest Efficiency for less desirable species. AUM calculations are based on 790 pounds per animal unit month (AUM) for a 1,000-pound cow with calf up to 4 months. No adjustments have been made for site grazability factors, such as steep slopes, site inaccessibility, or distance to drinking water.

The following is an example of how to calculate the recommended stocking rate. This example does not use production estimates from this specific ecological site. You will need to adjust the annual production values and run the calculations using total annual production values from the ecological sites encountered on each individual ranch/pasture. Before making specific recommendations, an on-site evaluation must be made.

Example of total annual production amounts by type of year:
Favorable years = 2200 lbs/acre
Normal years = 1480 lbs/acre
Unfavorable years = 1200 lbs/acre

It is recommended that on slopes of 30% or less, stocking rate should be derived from the total annual production pounds minus 500 pounds for residual dry matter and 25% harvest efficiency. On slopes over 30%, stocking rate is derived from total annual production pounds minus 800 pounds for residual dry matter and 25% harvest efficiency. Refer to the NRCS National Range and Pasture Handbook for a list of Animal Unit Equivalents.

Sample Calculations using Favorable Year production amounts:

< 30% slopes: AUM/AC = [(2200-500)(0.25)]/915 lbs/month for one AU = 0.46 AUM/AC
AC/AUM = (1.0 AU)/(0.46AUM/AC) = 2.2 AC/AUM

> 30% slopes: AUM/AC = [(2200-800)(0.25)]/915 lbs/month for one AU = 0.38 AUM/AC
AC/AUM = (1.0 AU)/(0.38 AU! M/AC) = 2.6 AC/AUM

NOTE: 915 lbs/month for one Animal Unit is used as the baseline for maintenance requirements. This equates to 30 lbs/day of air-dry forage (1200 lb cow at 2.5% of body weight).

Wildlife Interpretations: The Clayey ecological site occurs over large acreages on the Northern Rocky Mountain foothills, except where it is fragmented by conversion to cropland, which is significant in many areas. Habitat fragmentation of this site may have contributed to the decline of some “area sensitive” wildlife species, particularly such ground-nesting birds as the grasshopper sparrow. This site is home to a diverse native wildlife complex. Historically, huge herds of migratory bison and pronghorn as well as large numbers of sharp-tailed and sage grouse were probably the dominant “game” species in addition to a wide variety of ground-nesting songbirds, waterfowl and shorebirds, small mammals and mammalian predators. Grazing patterns, topographic diversity, extensive acreages and interspersion with other ecological sites provide niches for numerous wildlife species. Small mammal diversity and abundance is high which, in turn, supports a varied raptor population. Historically, vast prairie dog towns provided habitat for such species as the black-footed ferret, burrowing owl, mountain plover, ferruginous hawk, and swift fox. Invasive plant species such as leafy spurge, Canada thistle and several knapweeds contribute to a loss of biodiversity within this ecological site. Wildlife water requirements are provided by springs and seeps, intermittent and perennial streams and, in modern times, numerous artificial ponds and livestock pipelines. These areas are

locally important for northern leopard frogs, tiger salamanders, and a number of toad species, all of which feed on a variety of insects. Grazing, fire, drought cycles, and insect population fluctuations create a shifting mosaic of wildlife habitats across this site.

Plant Community 1: Tall and Medium Grasses, Forbs (HCPC): The diversity of plant species and life forms provides feeding substrate for a variety of pollinating insects. Grasshopper and Morman cricket infestations occasionally consume the majority of the herbaceous vegetation, especially during drought years. A variety of warm and cool water fish species inhabit the intermittent and perennial streams associated with this community. Northern pike, lake chub, carp, a variety of suckers and walleye are examples. Common reptile and amphibian species include tiger salamanders in ponds and stock tanks, Woodhouse's toad, western chorus frogs, bull snakes, rattlesnakes, and three species of garter snakes. The diversity of grass stature and life forms, along with scattered shrubs and a variety of forbs, provides habitat for many bird species including the upland sandpiper, loggerhead shrike, grasshopper and savanna sparrow, chestnut-collared longspur and western meadowlark. This community is especially favorable for ground-nesting birds because of the abundant residual plant material and litter available for nesting, escape and thermal cover. Diverse prey populations are available for raptors such as ferruginous and Swainson's hawks. When this plant community is adjacent to large blocks of sagebrush-grassland, it can provide quality sage grouse lek sites and brood habitat. The predominance of grasses plus a diversity of forbs, shrubs and half-shrubs in this community favors grazers and mixed feeders such as bison, pronghorn and elk. Complex plant structural diversity and litter cover provide habitat for a wide array of small mammals (both seed eaters, i.e. deer mice and herbivores, i.e. voles and jackrabbits) and neotropical migratory birds.

Plant Community 2: Medium and Short Grasses, Forbs: The decline in forb diversity reduces the variety of pollinating insects compared to the HCPC although insects may be quite abundant in this community. Wyoming big sagebrush, with canopy cover of 15-30%, and an understory of grasses and forbs, is excellent nesting, winter, brood-rearing and foraging habitat for sage grouse. Other obligate sagebrush-grassland species, notably Brewer's sparrow, also benefit from an increase in sagebrush cover. When residual grass and litter cover decrease in this community, ground nesting bird habitat values decline. This community often provides important winter range for mule deer and pronghorn. The sagebrush crowns break up hard crusted snow and provide about 15% protein and 40-60% digestibility for ungulates. Small mammal species composition may shift toward seed eaters such as the deer mouse and away from herbivores like the sagebrush vole.

Plant Community 3: Medium and Short Grasses, Forbs, Big Sagebrush: The diversity of insect pollinators may be reduced as desirable forbs are replaced by more aggressive species. The partial loss of structural diversity makes this plant community somewhat less attractive to the variety of wildlife species using the HCPC. A decrease in residual plant material and litter cover is usually associated with degradation of the HCPC, which makes this community less attractive for ground-nesting birds. Pronghorn make considerable use of this type because of forb and half-shrub availability in the generally open landscape.

Plant Community 4: Idaho Fescue, Medium and Short Grasses, Sagewort, Forbs: Insect variety is considerably reduced at this stage because palatable forbs are mostly absent. Insects, particularly grasshoppers, may be very abundant during high points in population cycles. Heavy stands of big sagebrush can provide winter cover and foraging habitat for mule deer, elk, pronghorn and sage grouse. However, a decline in herbaceous cover and litter reduces overall wildlife species diversity and habitat value for amphibians, ground-nesting birds and small mammals. Prairie dogs will have an easier time establishing and expanding towns in this community to the benefit of burrowing owls, mountain plovers, and black-footed ferrets.

Hydrological functions

The runoff potential for this site is low to moderate, depending on slope and ground cover/health. Runoff curve numbers generally range from 78 to 90. The soils associated with this ecological site are generally in Hydrologic Soil Group C. Soils have a slow infiltration rate when thoroughly wetted and consist chiefly of soils with moderately fine to fine textures.

Contributors

NRCS

Approval

Kirt Walstad, 7/19/2023

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	04/19/2005
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Slopes most common on this site are between 0 – 8% and with at least 95% of the soil surface well-covered there are no rills even with the most extreme convection storms. Rills would be rare on slopes of 9 – 15%.

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2. **Presence of water flow patterns:** Due to the soil surface being well covered and minimal slope there is no evidence of past or current soil deposition or erosion for this site.

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3. **Number and height of erosional pedestals or terracettes:** Wind and water erosion will not be evident on this site, so pedestals and terracettes will not be present.

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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 should be no more than 5% on this site.

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5. **Number of gullies and erosion associated with gullies:** Gully erosion will not be evident on this site.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Appearance or evidence of these erosional features or the landscape would not be present on this site.

7. **Amount of litter movement (describe size and distance expected to travel):** Because there is little bare ground, litter movement will be minimal at most. Because the site is dominated by the taller bunchgrasses, litter size will reflect the height and diameter of the reproductive culms and leaves of these grasses as well as the lesser dominate mid-size grasses.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Resistance to erosion will be high with soil stability values of 5 or 6; areas of bare soil on this site may have values less than 5 if not under plant canopy.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface structure is granular; A horizon depth is 5 – 8".

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Dominance of taller, deep rooted bunchgrasses will maximize infiltration and minimize runoff throughout the site.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** Will not be present generally, but there may be areas that have "healed" from former bison trails and wallows as well as more current livestock trails which could have a compaction layer below the soil surface.

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: Cool season, taller bunchgrasses (rough fescue, bluebunch wheatgrass)

    Sub-dominant: cool season midgrasses (Idaho fescue) = cool season rhizomatous grasses (western wheatgrass) = perennial forbs > shrubs = warm season short bunchgrass (plains muhly) = sedges

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Will be low for all functional groups in a given year. Prolonged droughts which last more than 3 years may show increases in mortality and decadence for all plant groups.

14. **Average percent litter cover (%) and depth (in):** Litter cover is 60-65 percent and tending to be less than 0.5 inches thick.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-**

production): 1450 - 2400 #/acre. This would be the expected production for the reference state during adequate moisture years. 2000 pounds would be the expected production in a 17 inch precipitation zone.

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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:** Kentucky/Canada bluegrass, shrubby cinquefoil, blue grama, Japanese brome, a variety of annual or biennial weedy forbs, fringed and cudweed sagewort, broom snakeweed, pussytoes, creeping juniper, field chickweed, cheatgrass.

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17. **Perennial plant reproductive capability:** During adequate moisture years bunchgrasses will generally produce seeds, however the cool season rhizomatous grasses may not necessarily produce seed even with adequate moisture.
