

Ecological site R046XS105MT

Clayey (Cy)

RRU 46-S 13-19 PZ

Last updated: 3/04/2025
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General information

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

Associated sites

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

Similar sites

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.
R046XS104MT	Silty (Si) RRU 46-S 13-19 PZ The Silty site differs mainly by soil texture.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Pseudoroegneria spicata</i> (2) <i>Festuca idahoensis</i>

Physiographic features

Table 2. Representative physiographic features

Landforms	(1) Plain (2) Fan (3) Terrace
Flooding frequency	None
Ponding frequency	None
Slope	0 – 20 %
Water table depth	150 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)	50-100 days
Freeze-free period (characteristic range)	110-120 days
Precipitation total (characteristic range)	360-460 mm
Frost-free period (actual range)	50-100 days
Freeze-free period (actual range)	100-130 days
Precipitation total (actual range)	330-460 mm
Frost-free period (average)	80 days
Freeze-free period (average)	110 days
Precipitation total (average)	410 mm

- (1) JOLIET [USC00244506], Joliet, MT
- (2) COLUMBUS [USC00241938], Columbus, MT
- (3) BIG TIMBER [USC00240780], Big Timber, MT
- (4) MELVILLE 4 W [USC00245603], Big Timber, MT
- (5) MARTINSDALE 3 NNW [USC00245387], Martinsdale, MT
- (6) NYE 2 [USC00246190], Fishtail, 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	50 cm
Available water capacity (0-101.6cm)	19.05 cm

Ecological dynamics

State and transition model

Figure 7. State and Transition Model

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Shrub/Vine					
0	Shrubs and Half-shrubs			242-397	
	Shrub, broadleaf	2SB	<i>Shrub, broadleaf</i>	0-132	–
	silver sagebrush	ARCAV2	<i>Artemisia cana ssp. viscidula</i>	0-132	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0-132	–
	mountain big sagebrush	ARTRV	<i>Artemisia tridentata ssp. vaseyana</i>	0-132	–
	rubber rabbitbrush	ERNAN5	<i>Ericameria nauseosa ssp. nauseosa var. nauseosa</i>	0-132	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0-132	–
Grass/Grasslike					
0	Grasses and Sedges			1130-1852	
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	488-1323	–
	spike fescue	LEKI2	<i>Leucopoa kingii</i>	0-529	–
	Idaho fescue	FEID	<i>Festuca idahoensis</i>	81-397	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	81-265	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	40-198	–

	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus ssp. lanceolatus</i>	40-198	–
	slender wheatgrass	ELTRS	<i>Elymus trachycaulus ssp. subsecundus</i>	0-198	–
	slender wheatgrass	ELTRT	<i>Elymus trachycaulus ssp. trachycaulus</i>	0-198	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	81-132	–
	Cusick's bluegrass	POCU3	<i>Poa cusickii</i>	0-132	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	81-132	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0-132	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0-132	–
	mountain brome	BRMA4	<i>Bromus marginatus</i>	0-132	–
	needleleaf sedge	CADU6	<i>Carex duriuscula</i>	0-132	–
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	0-132	–
	plains reedgrass	CAMO	<i>Calamagrostis montanensis</i>	0-132	–
	timber oatgrass	DAIN	<i>Danthonia intermedia</i>	0-132	–
	poverty oatgrass	DASP2	<i>Danthonia spicata</i>	0-132	–
	Letterman's needlegrass	ACLE9	<i>Achnatherum lettermanii</i>	20-100	–
	Columbia needlegrass	ACNEN2	<i>Achnatherum nelsonii ssp. nelsonii</i>	20-100	–
	western needlegrass	ACOCO	<i>Achnatherum occidentale ssp. occidentale</i>	20-100	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	20-100	–

Forb

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

Table 6. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 7. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 5.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 10. Community 6.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 11. Community 7.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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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 competitive 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 $AC/AUM = (1.0 AU)/(0.46 AUM/AC) = 2.2$ $AC/AUM > 30\%$ slopes: $AUM/AC = [(2200-800)(0.25)]/915$ lbs/month for one AU = 0.38 AUM/AC $AC/AUM = (1.0 AU)/(0.38 AU) = 2.6$ 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 interspersions 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 Mormon 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

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Approval

Kirt Walstad, 3/04/2025

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	03/01/2020
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are not present in the reference condition.

2. **Presence of water flow patterns:** Water flow patterns are not present in the reference condition.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are not evident in the reference condition.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**
Bare ground is low (5-10 percent). It consists of small, randomly scattered patches.

5. **Number of gullies and erosion associated with gullies:** Gullies are not present in the reference condition.

6. **Extent of wind scoured, blowouts and/or depositional areas:** Wind scoured, or depositional areas are not evident in the reference condition.

7. **Amount of litter movement (describe size and distance expected to travel):** Litter movement is not evident in the reference condition.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** The average soil stability rating is 4-6 under plant canopies and plant interspaces. The A horizon is 6-8 inches thick.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil Structure at the surface is typically strong to medium fine granular. A Horizon should be 6-8 inches thick with color, when wet, typically ranging in Value

of 4 or less and Chroma of 3 or less. Local geology may affect color in which it is important to reference the Official Series Description (OSD) for characteristic range. <https://soilseries.sc.egov.usda.gov/osdname.aspx>

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Infiltration of the Clayey ecological site is moderate to slow, and the site is well drained. An even distribution of mid stature grasses (70-75%) of site production, cool season shortgrass (15-20%) along with a mix of rhizomatous grasses (5-10%), forbs (5-10%), and shrubs (0-1%).
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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):** A compaction layer is not present in the reference condition. Soil profile may contain an abrupt transition to an Argillic horizon which can be misinterpreted as compaction, however, the subsoil structure will be fine to medium subangular blocky, where a compaction layer will be platy or structureless (massive).
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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

Dominant: Mid-statured, cool season, perennial bunchgrasses (Primarily bluebunch wheatgrass, spike fescue, green needlegrass)

Sub-dominant: shortgrass grasses/grasslikes (needle and thread, Idaho Fescue, plains muhly) > rhizomatous grass (western wheatgrass) > forbs > Shrubs

Other:

Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**
Mortality in herbaceous species is not evident. Species with bunch growth forms may have some natural mortality in centers is 3% or less.
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14. **Average percent litter cover (%) and depth (in):** Total litter cover ranges from 45-50%. Most litter is irregularly distributed on the soil surface and is not at a measurable depth.
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**
Average annual production is 2000. Low: 1700 High 2350. Production varies based on effective precipitation and natural variability of soil properties for this ecological site.
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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: Potential invasive (including noxious) species (native and non-native). Invasive species on this ecological site include (but not limited to) Kentucky bluegrass, smooth**

brome, sulphur cinquefoil, houndstongue, white top, Canada thistle, dandelion, annual brome spp., spotted knapweed, yellow salisify, leafy spurge, crested wheatgrass, etc. Native species such as fringed sagewort, Rocky Mountain juniper, ponderosa pine, limber pine, Douglas fir, lupine, broom snakeweed, Sandberg's bluegrass, etc. when their populations are significant enough to affect ecological function, indicate site condition departure.

17. **Perennial plant reproductive capability:** In the reference condition, all plants are vigorous enough for reproduction either by seed or rhizomes in order to balance natural mortality with species recruitment.
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