

Ecological site DX032X01B121

Limy Skeletal (LiSk)

Big Horn Basin

Rim

Last updated: 4/08/2025

Accessed: 07/16/2026

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): 032X–Northern Intermountain Desertic Basins

032X – Northern Intermountain Desertic Basins – This MLRA is comprised of two major Basins, the Big Horn and Wind River. These two basins are distinctly different and are split by LRU's to allow individual ESD descriptions. These warm basins are surrounded by uplifts and rimmed by mountains, creating a unique set of plant responses and communities. Unique characteristics of the geology and geomorphology single these two basins out. 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): 32X02B (WY): This LRU is the Big Horn Basin within MLRA 32. This LRU is lower in elevation, slightly warmer and receives slightly less overall precipitation than the Wind River Basin (LRU 02). This LRU was originally divided into two LRU's - LRU A which was the core and LRU B which was the rim. With the most current standards, this LRU is divided into two Subsets. This subset is Subset B, referred to as the Rim, is a transitional band between the basin floor and the lower foothills. The subset encircles Subset A which was originally LRU A. As the LRU shifts towards the south and tracks east, changes in geology and relation to the mountain position, creates a minor shift in soil chemistry influencing the variety of ecological sites and plant interactions. 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: Ustic Aridic – Prior to 2012, many of the soils within this group were correlated as Frigid Ustic Aridic or as Mesic Typic Aridic, with few mapped within this cross over zone. As progressive soil survey mapping continues, these “crossover” or transitional areas are being identified and corrected. Temperature Regime: Mesic Dominant Cover: Rangeland, with Saltbush flats the dominant vegetative cover for this LRU/ESD. Representative Value (RV) Effective Precipitation: 10-14 inches (254 – 355 mm) RV Frost-Free Days: 105-125 days A differentiating break in vegetation or response for this ecological site has not been identified between Big Horn Basin LRU subsets, and has only been identified in the upper regions of Subset A and throughout Subset B, so at this time the site is being placed in Subset B and will be written as a 7-12” site, as it spans the extent within Subset A thru B. If significant evidence is gathered to warrant a break into the two separate ecological sites it will then be revised.

Classification relationships

Relationship to Other Established Classification Systems: National Vegetation Classification System (NVC): 3 Xeromorphic Woodland, Scrub & Herb Vegetation Class 3.B Cool Semi-Desert Scrub & Grassland Subclass 3.B.1 Cool Semi-Desert Scrub & Grassland formation 3.B.1.NE Western North American Cool Semi-Desert Scrub & Grassland Division M169 Great Basin & Intermountain Tall Sagebrush Shrubland & Steppe Macrogroup G302 Artemisia Tridentata - Artemisia tripartita - Purshia tridentata Big Sagebrush Steppe Group CEG001535 - Artemisia tridentata ssp. wyomingensis/Pseudoroegneria spicata Herbaceous Vegetation or CEG001009 - Artemisia tridentata ssp. wyomingensis/Pseudoroegneria spicata Shrubland 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.g Big Horn Salt Desert Shrub Basin

Ecological site concept

- Site receives no additional water.
- Slope is less than 30 percent
- Soils are:
 - o Moderately deep to very deep (20-78 plus inches (50-200+ cm)
 - o less than 5 percent stone and boulder cover and greater than 35 percent cobble and gravel cover
 - o Skeletal (greater than or

equal to 35 percent rock fragments) within 20 inches (50 cm) of mineral soil surface o Violently effervescent starting within 4 inches (10 cm) of the mineral soil surface; calcium carbonates increases with depth o Clay content is less than 35 percent in top 4 inches (10 cm) of mineral soil surface; Textures range from fine sandy loam to clay loam 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 18 percent but less than or equal to 35 percent clay. (The particle size control section is the segment of the profile from either the start of an argillic horizon for 50 cm's or from 25-100 cm). o Non-saline, sodic, or saline-sodic

Associated sites

DX032X01B122	Loamy (Ly) Big Horn Basin Rim Loamy ecological site will occur in similar locations as the skeletal site, in areas were fewer rocks were deposited and may be associated with Limy Upland ecological site.
DX032X01B175	Skeletal (Sk) Big Horn Basin Rim Skeletal ecological site will occur in concave areas or areas with a deeper deposit of non-carbonitic alluvial materials. Where limy skeletal will occur on more convex or areas with a greater deposit of calcic materials.

Similar sites

DX032X01B120	Limy Upland (LiU) Big Horn Basin Rim Site has fewer rock fragments throughout the soil profile, a shift in grasses species, and greater management responses.
DX032X01B123	Loamy Calcareous (LyCa) Big Horn Basin Rim Site has carbonates starting lower in the profile, greater production and a shift in plant species between the two sites.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia tridentata ssp. wyomingensis</i> (2) <i>Krascheninnikovia lanata</i>
Herbaceous	(1) <i>Pseudoroegneria spicata</i> (2) <i>Hesperostipa comata</i>

Legacy ID

R032XB121WY

Physiographic features

This site occurs on nearly level to gently rolling land and on slopes generally less than 30 percent. Within the Big Horn Basin, this site is found to exist predominately on the gently sloping summits of erosional remnants or fan remnants that flow from the foothills into the basin proper. These landforms cross several climatic zones and are influenced by multiple geomorphic processes, for example: alluvial fans crossed/eroded by streams/stream terraces, covered by landslides, or breached by uplifts/escarpments. On a smaller scale, this site occurs in a patch-work dynamic at the base or across the basin floor (remnants) as wind and water move and shift sediments, derived from carbonate rich parent material, across the landscape (alluvium).

Table 2. Representative physiographic features

Landforms	(1) Intermontane basin > Alluvial fan (2) Intermontane basin > Fan remnant (3) Intermontane basin > Pediment (4) Intermontane basin > Strath terrace
Runoff class	Low to high
Elevation	1,160 – 1,890 m
Slope	0 – 30 %
Aspect	Aspect is not a significant factor

Climatic features

Mean Annual Precipitation ranges from 5 to 14 inches; however, when modeled, represents 7 to 12 inches of relative effective annual precipitation (178 – 305 mm). The normal precipitation pattern shows peaks in May and June and a secondary peak in September. This amounts to about 50 percent of the mean annual precipitation. Much of the moisture that falls in the latter part of the summer months is lost by evaporation and much of the moisture that falls during the winter time is lost by sublimation. Average snowfall is about 20 inches annually. Wide fluctuations may occur in yearly precipitation and result in more dry years than those with more than normal precipitation.

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.

Extreme storms may occur during the winter, but most severely affect ranch operations during the late winter and spring months. High winds are generally blocked from the basin by high mountains but can occur in conjunction with an occasional thunderstorm. Growth of native cool-season plants begins about April 1st and continues to about July 1st. Cool weather and moisture in September may produce some green-up of cool season plants that will continue to late October.

For detailed information visit the Natural Resources Conservation Service National Water and Climate Center at <http://www.wcc.nrcs.usda.gov/>. Clark 3NE, Cody, Cody 12SE, Heart Mtn, and Powell Fld Stn are the representative weather stations within LRU 01, Subset B. 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)	90-110 days
Freeze-free period (characteristic range)	120-140 days
Precipitation total (characteristic range)	180-250 mm
Frost-free period (actual range)	80-120 days
Freeze-free period (actual range)	110-140 days

Precipitation total (actual range)	180-310 mm
Frost-free period (average)	100 days
Freeze-free period (average)	130 days
Precipitation total (average)	200 mm

- (1) CLARK 3NE [USC00481775], Powell, WY
- (2) CODY 12SE [USC00481850], Meeteetse, WY
- (3) LOVELL [USC00485770], Lovell, WY
- (4) SHELL 1NE [USC00488124], Shell, WY
- (5) EMBLEM [USC00483031], Burlington, WY
- (6) TENSLEEP 16SSE [USC00488858], Ten Sleep, WY
- (7) BASIN [USC00480540], Basin, WY
- (8) GREYBULL [USC00484080], Greybull, WY
- (9) WORLAND [USW00024062], Worland, WY

Influencing water features

The characteristics of these upland soils have no influence from ground water (water table below 60 inches or 150 cm) and have minimal influence from surface water and overland flow. There may be isolated features that are affected by snowpack that persists longer than surrounding areas due to position on the landform (shaded or protected pockets), but overflow is not a suitable fit. No streams are classified within this ecological site.

Soil features

The soils of this site are moderately deep to very deep (greater than 20" to bedrock), moderately well to well drained, and moderately slow to moderate permeability. The soil characteristic having the most influence on the plant community is available moisture (affected by the calcium carbonates throughout the soil profile) and the potential to develop soluble salt near the surface. More data is needed to quantify these characteristics specifically for this site.

Major Soil Series correlated to this site include: Claprych, Larim, Clapper-like, Andergeorge-like, Clapper, Cascajo, Cascajo-like, and Milldraw.

Figure 7. Hand excavated soils pit for the Limy Skeletal ecological site within the Big Horn Basin.

Table 4. Representative soil features

Parent material	(1) Alluvium – igneous, metamorphic and sedimentary rock (2) Slope alluvium – calcareous conglomerate (3) Residuum – limestone and dolomite
Surface texture	(1) Very cobbly, very gravelly, extremely gravelly sandy clay loam (2) Clay loam (3) Loam

Family particle size	(1) Loamy-skeletal (2) Clayey-skeletal
Drainage class	Moderately well drained to well drained
Permeability class	Very slow to moderate
Soil depth	50 cm
Surface fragment cover $\leq 3"$	20 – 60 %
Surface fragment cover $> 3"$	0 – 40 %
Available water capacity (Depth not specified)	7.87 – 20 cm
Calcium carbonate equivalent (0-152.4cm)	20 – 30 %
Electrical conductivity (Depth not specified)	Not specified
Sodium adsorption ratio (Depth not specified)	0 – 10
Soil reaction (1:1 water) (Depth not specified)	7.8 – 8.4
Subsurface fragment volume $\leq 3"$ (Depth not specified)	20 – 60 %
Subsurface fragment volume $> 3"$ (Depth not specified)	0 – 60 %

Ecological dynamics

The Limy Skeletal ecological site within the Big Horn Basin Rim was originally correlated as a coarse upland range site. During the review of the coarse upland range site, several communities presented with more rock fragments throughout the profile than expected and there were areas that were found to have calcareous characteristics throughout the profile. Historically, classification of the soils in the Big Horn Basin did not recognize the calcareous tendencies. Although this site is similar to the Coarse Upland range site, the community potential and system resilience are altered by the chemistry within the soil. The dominance of bluebunch wheatgrass, increased bare ground or lichen cover and reduced production express the “shallow” acting characteristic of the site. Wyoming big sagebrush, although present on this site, is generally restricted in vigor and production compared to the Coarse Upland range site. Minimal research can be found for this particular ecological site.

Potential vegetation on this site, as with the Loamy site, is dominated by mid cool-season perennial grasses. Other significant vegetation includes winterfat, Wyoming big sagebrush, black sagebrush, and a variety of forbs. The expected potential composition for this site is 75 percent grasses, 10 percent forbs, and 15 percent woody plants. The composition and production will vary due to historic use and fluctuating precipitation.

As this site deteriorates species such as blue grama, threadleaf sedge, Sandberg bluegrass, and Wyoming big sagebrush will increase. Plains prickly pear and weedy annuals will invade. Cool-season grasses such as bluebunch wheatgrass, needle and thread, and Indian ricegrass will decrease in frequency and production.

Due to the amount and pattern of the precipitation, in combination with soil limitations, the Wyoming big sagebrush component has a lower vigor and overall structure than similar ecological sites within the same area. Sagebrush may not be resilient once it has been removed or severely reduced if a vigorous stand of grass exists and is maintained. Blue grama and threadleaf sedge may become the dominant vegetation if the area is subjected to frequent and severe (continuous season-long) periods of grazing, especially year-long grazing; resulting in a dense sod cover of blue grama and threadleaf sedge.

The reference plant community (description follows the plant community diagram) has been determined by study of relic rangeland sites, 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 (STM) Diagram for this ecological site. An STM has five fundamental components: states, transitions, restoration pathways, community phases and community pathways. The state, designated by the bold box, is a single community phase or suite of community phases. The reference state is recognized as State 1. It describes the ecological potential and natural range of variability resulting from the natural disturbance regime of the site. The designation of alternative states (State 2, etc) in STMs denotes changes in ecosystem properties that cross a certain threshold.

Transitions are represented by the arrows between states moving from a higher state to a lower state (State 1 - State 2) and are denoted in the legend as a “T” (T1-2). They describe the variables or events that contribute directly to loss of state resilience and result in shifts between states. Restoration pathways are represented by the arrows between states returning back from a lower state to a higher state (State 2 - State1 or better illustrated by State 1

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 (%)
Grass/Grasslike					
1	Mid-stature Cool-season Bunchgrasses			56-168	
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	56-140	10-25
	needle and thread	HECO26	<i>Hesperostipa comata</i>	28-84	5-15
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0-28	0-5
2	Rhizomatous Cool-season Grasses			0-56	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0-56	0-10
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus ssp. lanceolatus</i>	0-28	0-5
3	Short-stature Cool-season Bunchgrasses			0-56	
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0-28	0-5
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0-28	0-5
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0-28	0-5
	muttongrass	POFE	<i>Poa fendleriana</i>	0-28	0-5

4	Miscellaneous Grasses			0-28	
	Grass, perennial	2GP	<i>Grass, perennial</i>	0-28	0-5
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0-28	0-5
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	0-28	0-5
Forb					
5	Perennial Forbs			6-56	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0-22	0-5
	tapertip hawksbeard	CRAC2	<i>Crepis acuminata</i>	0-22	0-5
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0-22	0-5
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0-22	0-5
	Forb, perennial	2FP	<i>Forb, perennial</i>	0-22	0-5
	milkvetch	ASTRA	<i>Astragalus</i>	0-22	0-5
Shrub/Vine					
6	Dominant Shrubs			28-112	
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	28-84	5-15
	black sagebrush	ARNO4	<i>Artemisia nova</i>	0-84	0-15
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	0-56	0-10
7	Miscellaneous Shrubs			0-56	
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	0-28	0-5
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	0-28	0-5
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0-28	0-5

Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	Mid-stature Cool-season Bunchgrasses			28-84	
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	28-84	5-25
	needle and thread	HECO26	<i>Hesperostipa comata</i>	0-28	0-5
2	Rhizomatous Cool-season Grasses			0-56	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0-56	0-10
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus ssp. lanceolatus</i>	0-28	0-5
3	Short-stature Cool-season Grasses			28-84	
	squirreltail	ELEL5	<i>Elymus elymoides</i>	6-56	2-10
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	6-56	2-10
	muttongrass	POFE	<i>Poa fendleriana</i>	0-28	0-5
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0-28	0-5
4	Miscellaneous Grasses			0-28	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0-28	0-5
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	0-28	0-5
	Grass, perennial	2GP	<i>Grass, perennial</i>	0-28	0-5
Forb					
5	Perennial Forbs			6-56	
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0-28	0-5
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0-28	0-5
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0-28	0-5
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0-28	0-5

	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	6-28	2-5
	Forb, perennial	2FP	<i>Forb, perennial</i>	0-28	0-5
6	Annual Forbs			0-17	
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0-6	0-2
	flatspine stickseed	LAOC3	<i>Lappula occidentalis</i>	0-6	0-2
	western tansymustard	DEPI	<i>Descurainia pinnata</i>	0-6	0-2
	Forb, annual	2FA	<i>Forb, annual</i>	0-6	0-2
Shrub/Vine					
7	Dominant Shrubs			28-112	
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	28-112	5-25
	black sagebrush	ARNO4	<i>Artemisia nova</i>	0-84	0-20
8	Miscellaneous Shrubs			0-56	
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	0-56	0-5
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0-56	0-5
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	0-28	0-5

Table 7. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 8. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 9. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 10. Community 4.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 11. Community 5.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Animal community

Animal Community – Wildlife Interpretations: 1.1 - Bluebunch Wheatgrass/Needle and thread/Sagebrush (Reference Community): The predominance of grasses in this plant community favors grazers and mixed-feeders, such as bison, elk, and antelope. Suitable thermal and escape cover for deer may be limited due to the low quantities of woody plants. However, topographical variations could provide some escape cover. 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. 1.2 - Perennial Grasses/Sagebrush Plant Community: The combination of an overstory of sagebrush and an understory of grasses and forbs provide 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. 2.1 - Blue Grama/Threadleaf Sedge/Sagebrush Plant Community: This community provides limited foraging for antelope and other grazers. They may be used as a foraging site by sage grouse where reference state community phases are limited. Generally, these are not target plant communities for wildlife habitat management. 3.1 - Sagebrush/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 sage grouse. 4.1 - Perennial Grasses/Invasive Species/Sagebrush Plant Community and 4.2 - Invasive Species/Sagebrush Plant Community: The retained combination of sagebrush and the added diversity with the invasive grasses and/or forbs provide an extended plant community for wildlife. The similarities to Community Phase 1.2 (Rhizomatous Wheatgrasses/Perennial Grasses/Sod formers/Wyoming Big Sagebrush) are to some extent enhanced for some species with the added forage provided by the invasive species. But as the invasive species increase, decreasing the desirable species, the wildlife species benefits are decreased as well. 5.1 - Disturbed Lands Plant Community and 5.2 - Restored/Reclaimed Lands Plant Community: The variability of this site prevents a detailed

review of wildlife benefits. However, many of the introduced grasses, forbs and shrubs can provide adequate cover, feed and nesting sites for those wildlife species that would have selected the site prior to disturbance. Limitations and enhancements need to be considered by specific locations. Animal Community – Grazing Interpretations: The following table lists suggested stocking rates for cattle under continuous season-long grazing under normal growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of the conservation planning process. Often, the current plant composition does not entirely match any particular plant community (as described in this ecological site description). Because of this, a field visit is recommended, in all cases, to document plant composition and production. More precise carrying capacity estimates should eventually be calculated using this information along with animal preference data, particularly when grazers other than cattle are involved. Under more intensive grazing management, improved harvest efficiencies can result in an increased carrying capacity. If distribution problems occur, stocking rates must be reduced to maintain plant health and vigor. The Carrying capacity is calculated as the production for a normal year X .25 efficiency factor / 912.5 #/AUM to calculate the AUM's/Acre. Plant Community Production Carrying Capacity* Plant Community Description/Title: Lbs./Acre AUM/Acre Acres/AUM

1.1 Bluebunch Wheatgrass/Needleandthread/Sagebrush	150-450	0.09	11.2
1.2 Perennial Grasses/Sagebrush	150-400	0.07	14.6
2.1 Blue Grama/Threadleaf Sedge/Sagebrush	3.1		
3.1 Sagebrush/Bare Ground	4.1		
4.1 Perennial Grasses/Invasive Species/Sagebrush	4.2		
4.2 Invasive Species/Wyoming Big Sagebrush	5.1		
5.1 Disturbed Lands	** ** *		

* - Carry Capacity is figured for continuous, season-long grazing by cattle under average growing conditions. ** - Sufficient data for invaded and reclaimed communities has not been 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. Outside of plants, the extent offers a variety of Culture Resources to view on the landscape based on the location of many of these sites on higher ground on the benches and fans which also provides a rich source of geology for exploration. The extent of this ecological site is found within wild horse use areas; Pryor Mountain and McCullough Peaks. Wild horse/Wildlife Excursions are found as recreational venues for BLM lands and State lands within the Big Horn Basin. This ecological site, however, can prove to have limitations when associated with roadways and trails in relation to erosion potential and functionality. The soils will be sticky or slick when wet and are erosive.

Wood products

No appreciable wood products are present on the site.

Other products

Herbs: Several of the forb species within the communities of the Loamy Calcareous Ecological site have medicinal characteristics and have been used by the Native Americans in this area and more recently by the naturopathic profession. Ornamental Species: The forbs commonly found as well as the shrub component of these communities have been used in landscaping and xeriscaping.

Inventory data references

Information presented in the site description was derived from NRCS inventory data. Field observations from range trained personnel were also used. Those involved in developing the site include: Blaise Allen, Area Range Management Specialist, NRCS; and Marji Patz, Ecological Site Specialist, NRCS. Other sources used as references include USDA NRCS Water and Climate Center, USDA NRCS

National Range and Pasture Handbook, USDI and USDA Interpreting Indicators of Rangeland Health Version 3, and USDA NRCS Soil Surveys from various counties. Quality control and quality assurance completed by: Dan Mattke, Area Resource Soil Scientist, NRCS; Daniel Wood, MLRA Soil Survey Leader, NRCS; John Hartung, Wyoming State Rangeland Management Specialist, NRCS; Jeff Goats, Wyoming State Soil Scientist, NRCS; Scott Woodall, Regional Quality Assurance Ecological Site Specialist, NRCS. For specific data inquiries, contact the Powell, Wyoming Soil Survey Office (USDA-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. Read using the sample point computer program established by the High Plains Agricultural Research Center, WY). • Soil Stability (Slake Test – surface and subsurface samples collected and processed according to the soil stability guidelines provided by the Jornada Research Center, NM.)

Other references

Baker, William L. 2006. Fire and Restoration of Sagebrush Ecosystems. *Wildlife Society Bulletin* 34(1): 177-185.

Bestelmeyer, B., and J. R. Brown. 2005. State-and-transition models 101: a fresh look at vegetation change. *The Quivira Coalition Newsletter*, Vol. 7, No. 3.

Bestelmeyer, B., J. R. Brown, K. M. Havstad, B. Alexander, G. Chavez, J. E. Herrick. 2003. Development and use of state and transition models for rangelands. *Journal of Range Management* 56(2):114-126.

Bestelmeyer, B., J. E. Herrick, J. R. Brown, D. A. Trujillo, and K. M. Havstad. 2004. Land management in the American Southwest: a state-and-transition approach to ecosystem complexity. *Environmental Management* 34(1):38-51.

Herrick, J. E., J. W. Van Zee, K. M. Havstad, L. M. Burkett, and W. G. Whitford. 2005. Monitoring manual for grassland, shrubland and savanna Ecosystems. Volume I Quick Start. USDA - ARS Jornada Experimental Range, Las Cruces, New Mexico.

Herrick, J. E., J. W. Van Zee, K. M. Havstad, L. M. Burkett, and W. G. Whitford. 2005. Monitoring manual for grassland, shrubland and savanna Ecosystems. Volume II: Design, supplementary methods and interpretation. USDA - ARS Jornada Experimental Range, Las Cruces, New Mexico.

NRCS. 2014. (electronic) National Water and Climate Center. Available online at <http://www.wcc.nrcs.usda.gov/>

NRCS. 2014. (electronic) Field Office Technical Guide. Available online at http://efotg.nrcs.usda.gov/efotg_locator.aspx?map=WY NRCS. 2009. Plant Guide: Cheatgrass. Prepared by Skinner et al., National Plant Data Center.

Pellant, M., P. Shaver, D. A. Pyke, and J. E. Herrick. 2005. Interpreting indicators of rangeland health. Version 4. Technical Reference 1734-6. USDI-BLM. Ricketts, M. J., R. S. Noggles, and B. Landgraf-Gibbons. 2004. Pryor Mountain Wild Horse Range Survey and Assessment. USDA-Natural Resources Conservation Service.

Schoeneberger, P. J., D. A. Wysocki, E. C. Benham, and Soil Survey Staff. 2012. Field book for describing and sampling soils, Version 3.0. Natural Resources Conservation Service, National Soil Survey Center, Lincoln, NE. (<http://soils.usda.gov/technical/fieldbook/>)

Stringham, T. K. and W. C. Krueger. 2001. States, transitions, and thresholds: Further refinement for rangeland applications. Agricultural Experiment Station, Oregon State University. Special Report 1024.

Stringham, T. K., W. C. Kreuger, and P. L. Shaver. 2003. State and transition modeling: an ecological process approach. *Journal of Range Management* 56(2):106-113.

United States Department of Agriculture. Soil Survey Division Staff. 1993. Soil Survey Manual, United States Department of Agriculture Handbook No. 18, Chapter 3: Examination and Description of Soils. Pg.192-196.

USDA, NRCS. 1997. National Range and Pasture Handbook. (<http://www.glti.nrcs.usda.gov/technical/publications/nrph.html>)

Trlica, M. J. 1999. Grass growth and response to grazing. Colorado State University. Cooperative Extension. Range. Natural Resource Series. No. 6.108.

U.S. Department of Agriculture, Natural Resources Conservation Service (USDA/NRCS). 2007. The PLANTS Database (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

U.S. Department of Agriculture, Natural Resources Conservation Service (USDA/NRCS), Soil Survey Staff. 2010. Keys to Soil Taxonomy, Eleventh Edition, 2010.

USDA/NRCS Soil survey manuals for appropriate counties within MLRA 32X.

Western Regional Climate Center. (2014) (electronic) Station Metadata. Available online at: <http://www.wrcc.dri.edu/summary/climsmwy.html>.

Approval

Kirt Walstad, 4/08/2025

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.

Author(s)/participant(s)	Marji Patz
Contact for lead author	marji.patz@usda.gov; 307-271-3130
Date	03/29/2020
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rare to non-existent, but will have an increase of incurrence on steeper slopes of 10-30%.

2. **Presence of water flow patterns:** Barely observable but may be occurring on steeper slopes (10-30%)

3. **Number and height of erosional pedestals or terracettes:** Essentially non-existent, or rare if occurring.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**
Bare ground is 25 to 45% occurring in small patch-like areas throughout site.

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

6. Extent of wind scoured, blowouts and/or depositional areas: Rare to non-existent.

7. Amount of litter movement (describe size and distance expected to travel): Little to no plant litter movement occurring. Litter remains in place and is not moved by erosional forces.

8. Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values): Plant cover and litter is at 50 to 75% of soil surface and maintains soil surface integrity. Soil stability class is anticipated to be 3.0 or greater on average. Ranging from 1 in interspaces and up to 6 under plant canopy.

9. Soil surface structure and SOM content (include type of structure and A-horizon color and thickness): Soil data is limited for this site. A-horizons vary in depth from 1 to 12 inches with OM of 1-2%.

10. Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff: Plant community consists of, on average, 75% grasses, 10% forbs, and 15% shrubs. This, with an evenly distributed canopy and litter, with deep healthy rooted native grasses enhancing infiltration, limits the runoff potential to little or no effect on this site.

11. Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site): No compaction layer or soil surface crusting should be present.

12. Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):

Dominant: Mid-stature cool season bunchgrasses

Sub-dominant: perennial shrubs = cool season rhizomatous grasses

Other: perennial forbs > short stature bunchgrass and grass-like

Additional:

13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence): Minimal decadence noted, typically associated with shrub canopy. Through drought conditions will see some decadence with Bluebunch Wheatgrass.

14. **Average percent litter cover (%) and depth (in):** Litter ranges from 5 to 15% of total canopy with total litter including beneath the plant canopy can reach up to 50%. Herbaceous litter depth typically ranges from 3-10 mm, with woody littler varying between 4-6 cm.
-

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**
Total normal or average production is estimated at 400 lbs. with a low of 150 lbs. and ranging to 550 lbs.
-

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: Blue grama, Sandberg bluegrass, threadleaf sedge, fringed sagewort, prickly pear cactus, broom snakeweed and rubber rabbitbrush; alyssum, blue mustard, annual false wheatgrass, as well as other annuals, and then exotics and species found on the noxious weed list including but not limited to: cheatgrass, Russian thistle, kochia, and bull thistle.
-

17. **Perennial plant reproductive capability:** All species are capable of reproducing.
-