

Ecological site DX032X01A158

Shallow Clayey (SwCy)

Big Horn Basin Core

Last updated: 9/05/2019
Accessed: 06/08/2026

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

Major land resource area (MLRA): 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): 32X01A (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 A, referred to as the Core, which is warm, dry eroded basin floor. As the LRU shifts outer edges, aspect and relation to the major bodies of water and taller land forms create minor shifts 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, land form, and biological references. Older ESD's will refer to LRU A. LRU A and LRU 01 in MLRA 32X are synonymous. Moisture Regime: Typic Aridic, prior to 2012, there are map units that cross over to ustic aridic or ustic aridic was correlated into this core area. As progressive mapping continues and when the ability to do update projects, these overlapping map units will be corrected. Temperature Regime: Mesic Dominant Cover: Rangeland, with Saltbush flats the dominant vegetative cover for this LRU/ESD. Representative Value (RV) Effective Precipitation: 5-9 inches (127 – 229 mm) RV Frost-Free Days: 110-150 days

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 60%
- Soils are:
 - o Textures range from loam to clay in top 4" (10 cm) of mineral soil surface
 - o Clay content is 40% in top 4" (10 cm) of mineral soil surface
 - o All subsurface horizons have a weighted average of > 35% but 60% clay.
 - o Shallow (10-20 in. (25-50 cm) o 10% stone and boulder cover and 25% cobble and gravel cover
 - o Not skeletal (35% rock fragments) within 20" (50 cm) of mineral soil surface
 - o Non-saline, sodic, or saline-sodic; however, there is a potential for elevated soluble salts.

Associated sites

R032XY162WY	<p>Shallow Loamy (SwLy) 5-9" Big Horn Basin Precipitation Zone</p> <p>Shallow Loamy occurs in a complex with shallow clayey along escarpments or outcroppings of inter-bedded sedimentary parent material.</p>
R032XY104WY	<p>Clayey (Cy) 5-9" Big Horn Basin Precipitation Zone</p> <p>Clayey sites are commonly associated with Shallow Clayey sites on escarpments or along shale outcroppings. The clayey site is lower on the hillslope or further from the bedrock outcropping with shallow residing at the site of the outcropping.</p>
R032XY112WY	<p>Gravelly (Gr) 5-9" Big Horn Basin Precipitation Zone</p> <p>Gravelly sites will occur along the shoulder of a ridge or escarpment, with shallow clayey falling on the scarp face or down slope.</p>

Similar sites

R032XY358WY	<p>Shallow Clayey (SwCy) 10-14" East Precipitation Zone</p> <p>Shallow Clayey 10-14" Foothills and Basins East P.Z., 032XY358WY has higher production.</p>
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Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia tridentata ssp. wyomingensis</i>
Herbaceous	(1) <i>Pascopyrum smithii</i> (2) <i>Achnatherum hymenoides</i>

Legacy ID

R032XA158WY

Physiographic features

This site occurs on slopes and ridge tops, but may occur on all slopes.

Table 2. Representative physiographic features

Landforms	(1) Intermontane basin > Hill (2) Intermontane basin > Ridge (3) Intermontane basin > Escarpment
Runoff class	Negligible to very high
Elevation	1,130 – 1,830 m

Slope	0 – 60 %
Aspect	Aspect is not a significant factor

Climatic features

Annual precipitation and modeled relative effective annual precipitation ranges from 5 to 9 inches (127 – 229 mm). The normal precipitation pattern shows peaks in May and June and a secondary peak in September. The noted peaks account for approximately 50% of the mean annual precipitation. Much of the moisture that falls in the latter part of the summer is lost by evaporation and much of the moisture that falls during the winter 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 late winter and spring. 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 approximately on April 1st and continues through to 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/>. "Basin", "Emblem", "Greybull", "Lovell", "Worland FAA AP" and "Worland" are the representative weather stations for LRU A. 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)	110-120 days
Freeze-free period (characteristic range)	130-140 days
Precipitation total (characteristic range)	180-200 mm
Frost-free period (actual range)	110-120 days
Freeze-free period (actual range)	130-150 days
Precipitation total (actual range)	150-200 mm
Frost-free period (average)	110 days
Freeze-free period (average)	140 days
Precipitation total (average)	180 mm

- (2) WORLAND [USC00489770], Worland, WY
- (3) BASIN [USC00480540], Basin, WY
- (4) GREYBULL [USC00484080], Greybull, WY
- (5) EMBLEM [USC00483031], Burlington, WY
- (6) LOVELL [USC00485770], Lovell, WY

Influencing water features

Soil features

The soils of this site are shallow (10"-20" to bedrock) well-drained soils formed in alluvium or residuum. These soils have moderately slow to very slow permeability and may occur on all aspects. The bedrock is clay shale which is virtually impenetrable to plant roots. Thin ineffectual layers of other soil textures are disregarded. The soil characteristics having the most influence on the plant community are the shallow depths, heavy textures, and the potential for elevated quantities of soluble salts.

Major Soil Series correlated to this site includes: Persayo

Table 4. Representative soil features

Parent material	(1) Alluvium – interbedded sedimentary rock (2) Residuum – shale
Surface texture	(1) Clay loam (2) Clay (3) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Very slow to moderately slow
Depth to restrictive layer	30 – 50 cm
Soil depth	30 – 50 cm
Surface fragment cover <=3"	0 – 30 %
Surface fragment cover >3"	0 – 10 %
Available water capacity (0-101.6cm)	3.56 – 10.67 cm

Calcium carbonate equivalent (0-101.6cm)	0 – 10 %
Electrical conductivity (0-101.6cm)	0 – 10 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0 – 10
Soil reaction (1:1 water) (0-101.6cm)	7.4 – 10
Subsurface fragment volume <=3" (Depth not specified)	10 – 20 %
Subsurface fragment volume >3" (Depth not specified)	0 – 10 %

Ecological dynamics

Potential vegetation on this site is dominated by mid cool-season perennial grasses. Other significant vegetation includes Gardner saltbush, birdfoot sagebrush, and a variety of forbs. The expected potential composition for this site is about 70% grasses, 10% forbs and 20% woody plants. The composition and production will vary naturally due to historical use, fluctuating precipitation and fire frequency.

As this site deteriorates, species such as blue grama, birdfoot sagebrush and big sagebrush will increase. Plains pricklypear and weedy annuals will invade. Cool season grasses such as rhizomatous wheatgrasses, bottlebrush squirreltail, and Indian ricegrass will decrease in frequency and production.

The Historic Climax Plant Community (description follows the plant community diagram) has been determined by study of rangeland relic areas, or areas protected from excessive disturbance. Trends in plant communities going from heavily grazed areas to lightly grazed areas, seasonal use pastures, and historical accounts have also been used.

The following is a State and Transition Model Diagram that illustrates the common plant communities (states) that can occur on the site and the transitions between these communities. The ecological processes will be discussed in more detail in the plant community narratives following the diagram.

State and transition model

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1				67-101	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	67-101	–

2				34-67	
	squirreltail	ELELE	<i>Elymus elymoides ssp. elymoides</i>	34-67	-
3				17-34	
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	17-34	-
4				17-34	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	17-34	-
5				0-50	
	Grass, perennial	2GP	<i>Grass, perennial</i>	0-17	-
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0-17	-
	sedge	CAREX	<i>Carex</i>	0-17	-
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0-17	-
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0-17	-
Forb					
6				0-34	
	Forb, perennial	2FP	<i>Forb, perennial</i>	0-17	-
	textile onion	ALTE	<i>Allium textile</i>	0-17	-
	desertparsley	LOMAT	<i>Lomatium</i>	0-17	-
	phlox	PHLOX	<i>Phlox</i>	0-17	-
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0-17	-
Shrub/Vine					
7				0-34	
	bud sagebrush	PICRO	<i>Picrothamnus</i>	0-34	-
8				0-34	
	Gardner's saltbush	ATGA	<i>Atriplex gardneri</i>	0-34	-
9				0-34	
	birdfoot sagebrush	ARPE6	<i>Artemisia pedatifida</i>	0-34	-
10				0-17	
	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	0-17	-
11				0-17	
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	0-17	-
12				0-17	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0-17	-

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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Animal community

Animal Community – Wildlife Interpretations Rhizomatous Wheatgrasses/Indian Ricegrass (HCPC): 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. Perennial Grass/Mixed 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. Mixed Sagebrush/Blue Grama Sod Plant Community: These communities provide limited foraging for antelope and other grazers. They may be used as a foraging site by sage grouse if proximal to woody cover and if the Historic Climax Plant Community or the Mixed Shrub/Perennial Grass Plant Community is limiting. Generally, these are not target plant communities for wildlife habitat management. Salt Tolerant Shrub/Bare Ground Plant Community: This plant community exhibits a low level of plant species diversity due to the accumulation of salts near the soil surface. It may provide some thermal and escape cover for deer and antelope if no other woody community is nearby, but in most cases, it is not a desirable plant community to select as a wildlife habitat management objective. Salt Tolerant Shrub/Rhizomatous Wheatgrass 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. Animal Community – Grazing Interpretations The following table lists suggested stocking rates for cattle under continuous season-long grazing under normal growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of the conservation planning process. Often, the current plant composition does not entirely match any particular plant community (as described in this ecological site description). Because of this, a field visit is recommended, in all cases, to document plant composition and production. More precise carrying capacity estimates should eventually be calculated using this information along with animal preference data, particularly when grazers other than cattle are involved. Under more intensive grazing management, improved harvest efficiencies can result in an increased carrying capacity. If distribution problems occur, stocking rates must be reduced to maintain plant health and vigor. Plant Community Production Carrying Capacity* (lb./ac) (AUM/ac) Historic Climax Plant Community 150-375 .10 Perennial Grass/Mixed Sagebrush 100-300 .08 Mixed Sagebrush/Blue Grama Sod 50-150 .03 Salt Tolerant Shrub/Bare Ground 75-200 .03 Salt Tolerant Shrub/Rhizomatous Wheatgrasses 125-300 .05 * - Continuous, season-long grazing by cattle under average growing conditions. Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide 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.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group C and D. Infiltration ranges from very slow to moderately slow. Runoff potential for this site varies from moderate to high 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 will vary from none on sites with slopes of 9% to common on slopes of > 25%. Active gullies are restricted to concentrated water flow patterns. Water flow patterns will vary from barely observable on sites with slopes of 9% and from broken and irregular in appearance to continuous on slopes of > 25%. Pedestals are only slightly present in association with bunchgrasses such as bluebunch wheatgrass. Little to no plant litter movement occurs on slopes 9%. Litter movement does occur on slopes > 25%. 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 esthetic value that appeals to visitors.

Wood products

No appreciable wood products are present on the site.

Other products

None noted.

Inventory data references

Information presented here has been derived from NRCS inventory data. Field observations from range trained personnel were also used. Other sources used as references include: USDA NRCS Water and Climate Center, USDA NRCS National Range and Pasture Handbook, and USDA NRCS Soil Surveys from various counties. Inventory Data References Data Source Number of Records Sample Period State County SCS-RANGE-417 19 1965-1986 WY Park & others

Approval

Scott Woodall, 9/05/2019

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)	Ray Gullion
Contact for lead author	ray.gullion@wy.usda.gov
Date	05/02/2008
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

- 1. Number and extent of rills:** Due to the wide slope range associated with this site, the number and extent of rills will vary from none on sites with slopes of < 9% to common on slopes > 25%.

- 2. Presence of water flow patterns:** Due to the wide slope range associated with this site, water flow patterns will vary from barely observable on sites with slopes of < 9% from broken and irregular in appearance to continuous on slopes > 25%.

- 3. Number and height of erosional pedestals or terracettes:** Not evident on slopes < 9%. Erosional pedestals will be present with terracettes present at debris dams on slopes >9%.

- 4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is 35 to 45%.

5. **Number of gullies and erosion associated with gullies:** Active gullies restricted to concentrated water flow patterns.

6. **Extent of wind scoured, blowouts and/or depositional areas:** None.

7. **Amount of litter movement (describe size and distance expected to travel):** Little to no plant litter movement occurs on slopes < 9%. Litter movement does occur on slopes > 25%.

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% or greater of soil surface and maintains soil surface integrity. Stability class anticipated to be 5 or greater.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Use soil series description for depth and color of A-horizon.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Plant canopy (50% maximum), very slow to slow infiltration rates, the amount of bare ground, and steepness of slopes results in a naturally high runoff rate on slopes > 25%, even in HCPC.

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 would be expected except for the naturally occurring rooting restriction (bedrock or decomposing shale) at 10 to 20 inches.

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 grasses shrubs

Sub-dominant: forbs

Other: short grasses/grasslikes

Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very low.

14. **Average percent litter cover (%) and depth (in):** Average litter cover is 15-25% with depths of 0.1 to 0.2 inches. Litter cover is in contact with soil surface with little evidence of biological activity.

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

250 lbs/acre

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, Birdfoot sagebrush, Big sagebrush, Annuals, Exotics, and Species found on Noxious Weed List.**

17. **Perennial plant reproductive capability: No limitations.**
