

Ecological site DX032X01A162

Shallow Loamy (SwLy)

Big Horn Basin Core

Last updated: 5/13/2025

Accessed: 07/17/2026

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 are definitive features. 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 landforms 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 do 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. 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 CEGLO01535 - Artemisia tridentata ssp. wyomingensis/Pseudoroegneria spicata Herbaceous Vegetation or CEGLO01009 - 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 45%
- Soils Characteristics:
 - o Textures range from very fine sandy loam to clay loam in top 4" (10 cm) of mineral soil surface
 - o All subsurface horizons have a weighted average of >18% clay but 35% clay.
 - o Shallow to bedrock (10 - 20 +in. (25 - 50 +cm))
 - o 10% stone and boulder cover and 10% 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

Associated sites

DX032X01A122	Loamy (Ly) Big Horn Basin Core Loamy sites will be found down slope or in lower landscape positions along the same inter-bedded sedimentary parent material as Shallow Loamy.
DX032X01A112	Gravelly (Gr) Big Horn Basin Core Gravelly sites will occur along the exposed shoulder and Shallow Loamy occurs down slope or inward on the landform.
DX032X01A166	Shallow Sandy (SwSy) Big Horn Basin Core Shallow Sandy sites will occur in association with Shallow Loamy sites along the outcropping of inter-bedded sedimentary parent material and sandstone. They will also occur on the dipslopes and ridges of escarpments formed by these same parent materials.

Similar sites

DX032X02A162	Shallow Loamy (SwLy) Wind River Basin Core Shallow Loamy (SwLy) 5-9" Mesic Wind River Basin Ecological Sites are the equivalent ecological site concept for DX032X01A162 found in LRU 02 within the Major Land Resource Area 032X. These sites have slightly lower annual production.
DX032X01B162	Shallow Loamy (SwLy) Big Horn Basin Rim Shallow Loamy (SwLy) Big Horn Basin Rim has the same ecological site concept as DX032X01B162 but falls within a higher precipitation zone (10-14") and therefore supports higher production.

Table 1. Dominant plant species

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

Legacy ID

R032XA162WY

Physiographic features

Shallow Loamy Ecological Sites occur on steep slopes ranging up to 45%. Ridge tops, escarpments and hillsides are the major landforms where this site is found. This site generally comprises a small soils component mapped on these landforms. Soil deposition is minimal on steep slopes and the soils are less developed and shallow to bedrock. The geology and inherent soil chemistry is complex in the Northern Intermountain Desertic Basins. The Shallow Loamy Ecological Site lacks influence from saline/sodic soils and is a key factor to categorize it separately from other shallow sites.

There is no indication of a water table within 60 inches (150 cm) at any point throughout the calendar year. No additional overland flow of precipitation or moisture influences this site. This site also is characterized by no additional moisture capture.

Table 2. Representative physiographic features

Landforms	(1) Intermontane basin > Hillside (2) Intermontane basin > Ridge (3) Intermontane basin > Escarpment
Runoff class	Negligible to high
Elevation	1,130 – 1,830 m
Slope	0 – 50 %
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

- (1) WORLAND [USW00024062], Worland, WY
- (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

The characteristics of these upland soils have minimal influence from surface water/overland flow and no influence from ground water (water table below 60 inches (150 cm)). There may be isolated features that are affected by snow pack that persists longer than surrounding areas due to position on the landform (shaded/protected pockets). No streams are classified within this ecological site.

Soil features

The soils of this site are shallow (10"-20" (25-50 cm) to bedrock), well-drained soils formed in alluvium over residuum or in residuum. These soils have moderately slow to moderate permeability and may occur on all slopes. The bedrock may be any kind which is virtually impenetrable to plant roots, except igneous. The surface soil will have one or more of the following textures: very fine sandy loam, loam, silt loam, sandy clay loam, silty clay loam, and clay loam. Thin ineffectual layers of other textures are disregarded. The soil characteristics having the most influence on the plant community are the shallow depth, and potential for elevated quantities of soluble salts.

Major Soil Series correlated to this site includes: Hoot, Birdsley, Persayo

Table 4. Representative soil features

Parent material	(1) Alluvium – sandstone and shale (2) Residuum – interbedded sedimentary rock
Surface texture	(1) Loam (2) Silt loam (3) Clay loam (4) Sandy clay loam (5) Sandy loam (6) Fine sandy loam
Family particle size	(1) Loamy

Drainage class	Well drained
Permeability class	Moderately slow to moderate
Depth to restrictive layer	30 – 50 cm
Soil depth	30 – 50 cm
Surface fragment cover <=3"	0 – 10 %
Surface fragment cover >3"	0 – 10 %
Available water capacity (0-101.6cm)	1.27 – 8.89 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 10 %
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	7.4 – 10
Subsurface fragment volume <=3" (Depth not specified)	0 – 20 %

Ecological dynamics

Potential vegetation on this site is dominated by mid cool-season perennial grasses. Other significant vegetation includes yellow rabbitbrush, Wyoming big sagebrush, and a variety of forbs. The expected potential composition for this site is about 80% grasses, 10% forbs and 10% 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 and Wyoming big sagebrush will increase. Plains pricklypear and weedy annuals will invade. Cool season grasses such as bluebunch wheatgrass, Indian ricegrass, and rhizomatous wheatgrasses will decrease in frequency and production. Finally, weedy annuals will begin to invade including saltlover (halogeton) and cheatgrass.

The Reference State (State 1) (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 (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 - State 1) or better illustrated by R 2-1.

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	Rhizomatous wheatgrass			50-84	
	thickspike wheatgrass	ELLA3	<i>Elymus lanceolatus</i>	50-84	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus ssp. lanceolatus</i>	50-84	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	50-84	–
2	Bluebunch wheatgrass			84-118	
3	Indian ricegrass			34-84	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	34-84	–
4	Needleandthread grass			17-34	
	needle and thread	HECO26	<i>Hesperostipa comata</i>	17-34	–
5	Other			17-50	
	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	–
	Indian paintbrush	CASTI2	<i>Castilleja</i>	0-17	–
	larkspur	DELPH	<i>Delphinium</i>	0-17	–
	fleabane	ERIGE2	<i>Erigeron</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	Wyoming big sagebrush			0-34	
	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	0-34	–

8	Yellow rabbitbrush			0-17	
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	0-17	–
9	Other			0-17	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0-17	–

Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 7. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 4.1 plant community composition

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

Animal Community – Wildlife Interpretations 1.1 - Reference Plant Community: Bluebunch Wheatgrass/Rhizomatous Wheatgrasses: 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 Grass/Mixed Shrub 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. 2.1 - Mixed Shrub/Bare Ground Plant Community: This plant community can provide important winter foraging for elk, mule deer and antelope. 3.1 - 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 Reference Plant Community or the Perennial Grass/Mixed Shrub Plant Community is limiting. Generally, these are not target plant communities for wildlife habitat management. 4.1 - Invasive Plant Community: Early spring and fall green-up of cheatgrass provides foraging opportunities for many of our grazers and mixed feeders. However, as the invasive species increase, decreasing the desirable species, the wildlife species benefits are decreased as well. 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) Reference 150-375 .10 Perennial Grass/Mixed Shrub 100-300 .08 Mixed Shrub/Bare Ground 125-300 .05 Blue Grama Sod 050-125 .03 * - 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 B and C, with localized areas in hydrologic group D. Infiltration ranges from moderate to moderately rapid. 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 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 such as bluebunch wheatgrass. 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 cultural 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 the Boysen State Park and the Wind River Indian Reservation. These entities have served to protect and provide cultural significance to this ecological site. The Shallow Loamy ecological site has minimal limitations when associated with roadways and trails, and provides a sound base for travel and camping in relation to erosion potential and functionality.

Wood products

No appreciable wood products are present on the site.

Other products

Herbs: The forb species of the Shallow Loamy 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 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

Kirt Walstad, 5/13/2025

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)	Ray Gullion
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Date	05/02/2008
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. Number and extent of rills: Rills should not be present

2. Presence of water flow patterns: Barely observable

3. Number and height of erosional pedestals or terracettes: Essentially non-existent

4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):
Bare ground is 40-60% occurring in small areas throughout site

5. Number of gullies and erosion associated with gullies: Active gullies should be restricted to areas of concentrated water flow patterns on steeper slopes

6. Extent of wind scoured, blowouts and/or depositional areas: Small scoured sites may be observed

7. Amount of litter movement (describe size and distance expected to travel): Litter movement is little to none based on topography and water flow patterns

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. Soil Stability class is anticipated to be 4 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: Grass canopy and basal cover should reduce raindrop impact and slow overland flow providing increased time for infiltration to occur. Infiltration is moderate.

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 Bunch Grasses Mid Stature Rhizomatous Grasses Short

Sub-dominant: Shrubs Forbs

Other: 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/ac
-

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, Big sagebrush, Annuals, Exotics, and Species found on Noxious Weed List
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17. **Perennial plant reproductive capability:** All species are capable of reproducing
-