

Ecological site DX032X01A112

Gravelly (Gr)

Big Horn Basin Core

Last updated: 5/13/2025

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General information

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

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): 32X01 (WY): This LRU is the core of the Big Horn Basin, comprised of the eroded basin floor. As the LRU shifts towards the 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 to 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: 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 CEGL001535 - Artemisia tridentata ssp. wyomingensis/Pseudoroegneria spicata Herbaceous Vegetation 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 50%
- Soils are:
 - o Textures range from loamy sand to very fine sandy loam in top 4" (10 cm) of mineral soil surface
 - o Clay content is or = 18% in top 4" (10 cm) of mineral soil surface
 - o All subsurface horizons in the particle size control section have a weighted average of 18% 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's).
 - o Moderately deep to very deep (20-80+ in. (50-200+ cm)
 - o 3% stone and boulder cover and >35% cobble and gravel cover (generally around 60%)
 - o Skeletal (>35% rock fragments) within 20" (50 cm) of mineral soil surface
 - o Non-saline, sodic, or saline-sodic

Associated sites

R032XY122WY	Loamy (Ly) 5-9" Big Horn Basin Precipitation Zone Loamy sites are common on interior to the wind swept edges that have left gravels exposed.
R032XY150WY	Sandy (Sy) 5-9" Big Horn Basin Precipitation Zone, Sandy sites are found lower in the landscape or in depositional areas where the gravel beds have not been exposed.
R032XY162WY	Shallow Loamy (SwLy) 5-9" Big Horn Basin Precipitation Zone Shallow Loamy sites are found with gravelly when the gravelly conglomerate bedrock has not degraded and serves as a restrictive layer with a loamy cap, and surrounding areas are exposed showing a gravelly site.
R032XY166WY	Shallow Sandy (SwSy) 5-9" Big Horn Basin Precipitation Zone Shallow Sandy sites are found on alluvial deposits over sandstone parent material or on conglomerates with a sandstone parent material weathers to expose gravels in areas or sandy pockets in others.

Similar sites

R032XY312WY	Gravelly (Gr) 10-14" East Precipitation Zone Gravelly 10-14" Foothills and Basin East P.Z., 032XY312WY has higher production.
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Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Pseudoroegneria spicata</i> (2) <i>Hesperostipa comata</i>

Legacy ID

R032XA112WY

Physiographic features

This site occurs on nearly level to 50% slopes.

Table 2. Representative physiographic features

Landforms	(1) Intermontane basin > Alluvial fan (2) Intermontane basin > Hill (3) Intermontane basin > Plateau
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Runoff class	Negligible to low
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
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- (1) BASIN [USC00480540], Basin, WY
- (2) EMBLEM [USC00483031], Burlington, WY
- (3) GREYBULL [USC00484080], Greybull, WY
- (4) LOVELL [USC00485770], Lovell, WY
- (5) WORLAND [USC00489770], Worland, WY
- (6) WORLAND [USW00024062], Worland, WY

Influencing water features

The characteristics of these upland soils have no influence from ground water (water table below 60 inches (150 cm)) and have minimal influence from surface water/overland flow. No streams are classified within this ecological site.

Soil features

The soils of this site are moderately deep (greater than 20" to bedrock) to very deep, well to excessively well-drained soils that formed in alluvium or alluvium over residuum. These soils have moderately rapid, or rapid permeability. The surface soil will vary from 3 to 6 inches deep. The coarser topsoil may be included if underlain by finer textured subsoil. The soil characteristic having the most influence to the plant community is high volume of coarse fragments on the surface and in the profile, which reduces plant density and available moisture.

Table 4. Representative soil features

Parent material	(1) Alluvium – igneous, metamorphic and sedimentary rock (2) Residuum – sandstone
Surface texture	(1) Very gravelly fine sandy loam (2) Sandy loam (3) Loam (4) Very fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained to excessively drained
Permeability class	Moderately rapid to rapid
Soil depth	50 – 150 cm
Surface fragment cover <=3"	20 – 50 %
Surface fragment cover >3"	0 – 10 %

Available water capacity (0-101.6cm)	3.56 – 12.19 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 30 %
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	0 – 10
Soil reaction (1:1 water) (0-101.6cm)	7.4 – 8.4
Subsurface fragment volume <=3" (Depth not specified)	10 – 40 %
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 winterfat, big sagebrush and a variety of forbs. The expected potential composition for this site is about 75% grasses, 10% forbs and 15% 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 threadleaf sedge, Sandberg bluegrass and big sagebrush will increase. Plains pricklypear and weedy annuals will invade. Mid grasses such as bluebunch wheatgrass, needleandthread, and rhizomatous wheatgrasses 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				99-140	
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	99-140	–
2				28-71	
	needle and thread	HECO26	<i>Hesperostipa comata</i>	28-71	–
3				15-43	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	15-43	–
4				15-28	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	15-28	–
5				15-43	
	Grass, perennial	2GP	<i>Grass, perennial</i>	0-15	–
	sedge	CAREX	<i>Carex</i>	0-15	–
	squirreltail	ELELE	<i>Elymus elymoides ssp. elymoides</i>	0-15	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0-15	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0-15	–
Forb					
6				0-28	
	Forb, perennial	2FP	<i>Forb, perennial</i>	0-15	–
	larkspur	DELPH	<i>Delphinium</i>	0-15	–
	phlox	PHLOX	<i>Phlox</i>	0-15	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0-15	–
Shrub/Vine					
7				15-43	
	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	15-43	–
8				0-15	
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	0-15	–
9				0-15	
	yucca	YUCCA	<i>Yucca</i>	0-15	–
10				0-15	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0-15	–

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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Animal community

Animal Community – Wildlife Interpretations Historic Climax Plant 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. Perennial Grass/Mixed Shrub: These communities provide foraging for antelope and other grazers.

They may be used as a foraging site by sage grouse if proximal to woody cover. Mixed Shrub/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 and brood rearing habitat for sage grouse. Threadleaf sedge/Bare Ground: These communities provide limited grazing for antelope and other herbivores due to low production. They may be used as a foraging site by sage grouse if proximal to woody cover. 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 150-350 .10 Perennial Grass/Mixed Shrub 100-300 .08 Mixed Shrub/Bare Ground 50-175 .03 Threadleaf Sedge/Bare Ground 25-75 .02 * - 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, with localized areas in hydrologic group C. Infiltration potential for this site varies from moderately rapid to rapid depending on soil hydrologic group and ground cover. Runoff varies from low to moderate. 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 variety 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

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
Contact for lead author	ray.gullion@wy.usda.gov
Date	02/19/2008
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 slope < 9% to common on slopes > 25%
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- 2. Presence of water flow patterns:** Due to the wide slope range associated with this site, water flow patterns vary from barely observable on slopes of < 9% from broken and irregular in appearance to continuous on slopes > 25%
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- 3. Number and height of erosional pedestals or terracettes:** Not evident on slopes < 9%, present on slopes > 9%
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- 4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is 10-20%. 20-50% of soil surface is coarse fragments
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- 5. Number of gullies and erosion associated with gullies:** Active gullies restricted to concentrated water flow patterns on steeper slopes
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- 6. Extent of wind scoured, blowouts and/or depositional areas:** None
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- 7. Amount of litter movement (describe size and distance expected to travel):** Little to no plant litter movement on slopes < 9%. Litter movement does occur on slopes > 9%
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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 40% or greater of soil surface and maintains soil surface integrity. Soil Stability class is anticipated to be 4 or greater.
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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 varies with soil texture from moderately rapid to rapid.
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11. Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site): No compaction layer or soil surface crusting should be present.
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12. Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):
- Dominant: Mid stature Bunch Grasses
- Sub-dominant: mid stature rhizomatous & short grasses
- Other: Shrubs Forbs
- Additional:
-
13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):
Some plant mortality and decadence is expected
-
14. Average percent litter cover (%) and depth (in):
-
15. Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):
200lbs/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: Threadleaf sedge, blue grama, big sagebrush, shadscale saltbush, rubber rabbitbrush, annuals, exotics, and Species found on Noxious Weed List
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17. Perennial plant reproductive capability: May be Limited due to effective moisture and seed to soil contact
