

Ecological site DX032X01B110

Dense Clay (DC)

Big Horn Basin Rim

Last updated: 9/05/2019

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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): 32X01B (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

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 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 30%
- Soils are:
 - o Textures range from fine sandy clay loam to clay in top 4" (10 cm) of mineral soil surface
 - o Clay content is 35% in top 4" (10 cm) of mineral soil surface
 - o All subsurface horizons in the particle size control section have a weighted average of ? 35% 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 Not skeletal (35% rock fragments) within 20" (50 cm) of mineral soil surface
 - o None to Slightly effervescent throughout top 20" (50 cm) of mineral soil surface
 - o Non-saline, sodic, or saline-sodic

Site drafted from historic range site: R032XY118WY. Based on heavy clay soils that develop large cracks at the surface when dry. Site has a thin cap of coarser soils on the surface. This community is dominated by birdfoot sagebrush

and generally lacks Wyoming big sagebrush.

Associated sites

R032XY104WY	Clayey (Cy) 5-9” Big Horn Basin Precipitation Zone Dense clay will occur in small swales or side slopes with the clayey site. Sit is both associated and similar.
R032XY138WY	Saline Lowland (SL) 5-9” Big Horn Basin Precipitation Zone Saline Lowland is found in association with Dense Clay in perennial or intermittent stream channels. Saline Lowland is a step below Dense clay where the water table has an influence on the vegetation. Dense Clay will be a riser or step above the water table in depressions or along a drainage system.
R032XY144WY	Saline Upland (SU) 5-9” Big Horn Basin Precipitation Zone Saline Upland sites will occur in close proximity with Dense Clay. Dense Clay will be higher on the landform with lower affect by salt accumulations. Site is both associated and similar.

Similar sites

R032XY118WY	Impervious Clay (IC) 5-9” Big Horn Basin Precipitation Zone Clayey site is similar to Dense Clay but is lacking the coarser surface textures and Clayey supports Wyoming Big Sagebrush more than birdfoot sagebrush, and has a greater composition of mid-stature cool-season grasses. Overall, production is greater on a clayey site.
R032XY344WY	Saline Upland (SU) 10-14" East Precipitation Zone Saline Upland may be similar in production with a shift in species. Saline Upland is Gardner's saltbush dominated (significant salts - sodic, saline, gypsic, saline-sodic) while Dense Clay is birdfoot sagebrush dominated (minimal to no salt accumulations).

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia pedatifida</i>
Herbaceous	(1) <i>Pascopyrum smithii</i> (2) <i>Elymus elymoides</i>

Legacy ID

R032XB110WY

Physiographic features

This site occurs on nearly level up to 30% 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 – 30 %
Aspect	Aspect is not a significant factor

Climatic features

Annual Precipitation and modeled relative effective annual precipitation ranges from 10 to 14 inches (254 – 355 mm). The normal precipitation pattern shows peaks in May and June and a secondary peak in September. This amounts to about 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 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", "Powell Fld Stn", "Shell 1NE", and "Thermopolis 9NE" are the representative weather stations. 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)	90-90 days
Freeze-free period (characteristic range)	110-120 days
Precipitation total (characteristic range)	180-280 mm
Frost-free period (actual range)	80-110 days
Freeze-free period (actual range)	110-130 days
Precipitation total (actual range)	180-310 mm

Frost-free period (average)	90 days
Freeze-free period (average)	120 days
Precipitation total (average)	230 mm

- (1) SHELL 1NE [USC00488124], Shell, WY
- (2) CODY 12SE [USC00481850], Meeteetse, WY
- (3) CODY [USC00481840], Cody, WY
- (4) HEART MTN [USC00484411], Powell, WY
- (5) POWELL FLD STN [USC00487388], Powell, WY
- (6) CLARK 3NE [USC00481775], Powell, WY
- (7) THERMOPOLIS 9NE [USC00488884], Thermopolis, 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 very shallow (less than 10”) to very deep, well to poorly drained soils formed in alluvium or alluvium over residuum. Layers of the soil most influential to the plant community varies from 3 to 6 inches thick. These soils have slow to very slow permeability. The topsoil, except for thin ineffectual layers, will be heavy clays and/or soils that develop large cracks when dry and are very sticky when wet. These sites typically have moderate saline and /or alkaline soils, but high amounts of soluble salt can occur. The soil characteristics having the most influence on plants are the very slow infiltration rate, which reduces the available moisture, and the amount of soluble salts.

Table 4. Representative soil features

Parent material	(1) Alluvium – interbedded sedimentary rock (2) Residuum – shale
Surface texture	(1) Clay (2) Silty clay (3) Sandy clay loam (4) Clay loam
Drainage class	Poorly drained to well drained
Permeability class	Slow to very slow
Soil depth	50 – 150 cm

Available water capacity (0-101.6cm)	1.42 – 20 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 20 %
Electrical conductivity (0-101.6cm)	0 – 20 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0 – 30
Soil reaction (1:1 water) (0-101.6cm)	7.9 – 10

Ecological dynamics

****Disclaimer**** This PROVISIONAL ecological site was developed for the dryer, basin core, so production values are lower than expected for this site description.

Potential vegetation on this site is dominated by salt tolerant, drought resistant, mid cool-season perennial grasses and shrubs. The expected potential composition for this site is about 50% grasses, 10% forbs and 40% 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 Sandberg bluegrass and birdfoot sagebrush will increase. Plains pricklypear and weedy annuals will invade. Cool season grasses such as rhizomatous wheatgrass, 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				34-56	
	squirreltail	ELELE	<i>Elymus elymoides</i> ssp. <i>elymoides</i>	34-56	–
2				11-34	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	11-34	–

3				11-34	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	11-34	–
4				0-11	
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0-11	–
5				0-11	
	Grass, perennial	2GP	<i>Grass, perennial</i>	0-11	–
Forb					
6				0-22	
	Forb, perennial	2FP	<i>Forb, perennial</i>	0-11	–
	woodyaster	XYLOR	<i>Xylorhiza</i>	0-11	–
Shrub/Vine					
7				45-90	
	birdfoot sagebrush	ARPE6	<i>Artemisia pedatifida</i>	45-90	–
8				0-22	
	bud sagebrush	PICRO	<i>Picrothamnus</i>	0-22	–
9				0-22	
	Gardner's saltbush	ATGA	<i>Atriplex gardneri</i>	0-22	–
10				0-11	
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	0-11	–
11				0-11	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0-11	–

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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Animal community

Animal Community – Wildlife Interpretations Historic Climax Plant Community: The composition of grasses and shrubs in this plant community favors feeders, such as antelope. Because of the low growing shrub component this is not suitable for thermal and escape cover for deer, but may be preferred by antelope or other wildlife. 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. Prairie dogs and other small mammals prefer these areas as tall, dense stands of vegetation impede recognition and escape from predators. Mixed Perennial Grass/Birdfoot Sagebrush: This plant community exhibits a low level of plant species diversity but is an important winter range for antelope. 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. Prairie dogs and other small mammals prefer these areas as tall, dense stands of vegetation impede recognition and escape from predators. Birdfoot Sagebrush/Bare Ground: This plant community has a low level of diversity. Due to the dominance of annual weeds and grasses, feed for large mammals is limited. Areas of bare ground may provide leks for birds such as sage grouse or habitat for Prairie dogs and other small mammals.

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 100-300 .08 Mixed Perennial Grass/Birdfoot Sagebrush 50-225 .06 Birdfoot Sagebrush/Bare Ground 25-100 .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 C and D. Infiltration ranges from slow to very slow. Runoff potential for this site varies from high to very 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. 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

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.

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Date	02/19/2008
Approved by	
Approval date	

Composition (Indicators 10 and 12) based on	Annual Production
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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%

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% and 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 50-70%, occurring in small openings throughout the site.

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 30% or greater of soil surface and maintains soil surface integrity. Soil Stability class is 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:** Sparse plant canopy, slow infiltration rates, and the high amount of bare ground contribute to 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 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: Shrubs

Sub-dominant: Mid stature Grasses

Other: Forbs = short stature grasses

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
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14. Average percent litter cover (%) and depth (in):
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15. Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production): 200lbs/ac
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16. Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site: Birdfoot sagebrush, Sandberg bluegrass, Woody aster, 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
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